FEDEGARI AUTOCLAVI SPA

OPERATING MANUAL

STERILIZER MOD. **FVA**

0123

Document Code: #68181 Rev.1

AUTOCLAVE

Model: FVA2 – FVA3

THIS MANUAL'S INFORMATION REFERS TO THE MACHINE, COMPLETE WITH ALL OPTIONAL FITTINGS. THE MACHINE CONFIGURATION DESCRIBED BELOW DEFINES THE OPTIONS AVAILABLE DURING FINAL TESTS, BEFORE DELIVERY.

MACHINE CONFIGURATION:

●		**BASIC MACHINE**
○	**K10**	**STEAM GENERATOR**
○	**K20**	**VACUUM PUMP**
○	**K30**	**EFFLUENT COOLER**
○	**K40**	**INTERNAL AIR ELECTROCOMPRESSOR**
○	**K43**	**EXTERNAL AIR ELECTROCOMPRESSOR**
○	**K50**	**AIR STERILIZING FILTER**
○	**K51**	**NETWORK COMPRESSED AIR SUPPLY UNIT**
○	**K52**	**QUICK COOLING UNIT**
○	**K53**	**SPONTANEOUS COOLING**
○	**K61**	**CHAMBER PRESSURE LEAK TEST**
○	**K62**	**DECONTAMINATION CYCLE**
○	**K70**	**STEAM SUPPLY DEFLECTION UNIT**
○	**K80**	**ADDITIONAL HEAT PROBE**
○	**K81**	**PROCESS PRINTER**
○	**K82**	**KIT EN285–DATALOGGER**
○	**HW1**	**SECONDARY RS232 SERIAL OUTPUT**
○	**SW1**	**CONTROL FUNCTION FO**
○	**T30**	**DEIONIZER**
○	**SW2**	**CYCLE REPETITION**

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WARNING

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Model: **FVA–HT**

MACHINE CONFIGURATION:

- **K10 STEAM GENERATOR**
- **K30 EFFLUENT COOLER**
- **K50 AIR STERILIZING FILTER**
- **K51 NETWORK COMPRESSED AIR SUPPLY UNIT**
- **K52 QUICK COOLING UNIT**
- **K61 CHAMBER PRESSURE LEAK TEST**
- **K62 DECONTAMINATION CYCLE**
- **K80 ADDITIONAL HEAT PROBE**
- **K81 PROCESS PRINTER**
- **HW2 HIGH PATHOGEN**
- **SW2 CYCLE REPETITION**

This sterilizer is designed in such a way as to prevent any contamination hazard to the environment and the operators. For this reason, the sterilizer operates as follows:

1. It does not extract the air from the chamber, since all filters, even high–retention ones, are useless in the presence of small agents, such as prions.
2. It keeps in the chamber the condensate that forms during the process, until the sterilization has been completed; however, the first condensate which may be produced is not sterile.

The steam + air mixture forming in the sterilization chamber is kept homogeneous by a fan positioned inside the chamber. As a matter of fact, the air density (at the same temperature and pressure) is approximately 1.7 times higher than the water steam density, and without this measure the air would stratify on the bottom of the chamber, resulting in intolerable temperature gradients.
The temperature of the steam + water mixture forming in the chamber will depend on the selected sterilization temperature.
The mixture pressure will consist of the addition of two factors:

1. The water steam pressure at the selected sterilization temperature.
2. The air pressure at the selected sterilization temperature.

If, for example, the sterilization process is carried out at 140°C:

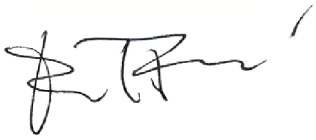
- factor 1 is 3,61 absolute bar (water steam pressure 140°C);
- factor 2 can be calculated as follows: when the sterilizer is closed at room temperature (approx. 20°C), the pressure of the air closed in the chamber is about the room pressure, i.e. 1,0 absolute bar. The air, however, heats up at 140°C, increasing its pressure in the ratio of initial to final heating temperatures, and accordingly pressure becomes:

$$1{,}0 \times \frac{140 + 273}{20 + 273} = 1{,}0 \times \frac{413}{293} = 1{,}41 \text{ absolute bar}$$

- The total pressure of the steam + air mixture in the chamber will be 138°C: 3,61 + 1,41 = 5,02 absolute bar.

The sterilizer is therefore designed to operate up to 4.70 rel. or manometric bar (i.e. above the atmospheric pressure), up to 5.70 absolute bar.

ADDITION AND CHANGE REGISTRATION

	Name function	Name acronym	Date (dd/mm/yy)	Signature
PREPARED BY:	IDO	FAP	23/05/01	
CHECKED AND APPROVED BY:	ING	FAF	23/05/01	

Review	Date	Description
F.I.DT.00089.A.0.E.06.97	15/06/97	First issue, software version VC0001.0
F.I.DT.00089.B.0.E.01.98	19/01/98	Modifications in and additions to all Chapters
F.I.DT.00089.B.1.E.06.98	15/06/98	Modifications in and additions to Paragraphs: 2.4.1. – 3.3.1. – 3.3.2. 5.5.1. – 5.5.2. – 6.2.9. – 8.3.3. 8.3.4.1. – 8.4.1. – 8.4.4. Addition of Paragraph 8.4.5.
F.I.DT.00089.C.1.E.02.99	25/02/99	New version – software VC0002.0 and VC0002.1
F.I.DT.00089.D.1.E.12.99	13/12/99	New version – software VC0002.4 Upgrade software VC0002.5 (allow to imput new serial number. – es. NA0123ED)
#68181 Rev.1	23/05/01	New software version: VC0002.9

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1. FOREWORD

1.1. PUBLICATION IDENTIFICATION

The "OPERATING MANUAL" is an official document issued by FEDEGARI AUTOCLAVI S.p.A. (hereinafter referred to as FEDEGARI) and forms and integral part of the machine. It is identified by a document code printed on the cover, to allow for its identification, traceability and reference.
FEDEGARI reserves the right to change this manual at any time and without notice.

1.1.1. Allied documentation

Main manuals and documents

- Technical reference documents, including:
  - * Installation drawing;
  - * P&ID drawing;
  - * Instrument legend;
  - * Wiring diagrams.

1.2. PUBLICATION OBJECTIVE

This manual is addressed to the users of sterilizers belonging to the series mentioned in the heading. It includes the information required to use the machine properly. Good performance and durability of this machine, as well as operators' safety and processed product protection, depend on compliance with this manual's rules and instructions.

Read it carefully and comply with its requirements and instructions.

Its information is updated to the printing date.

1.3. REFERENCES TO RULES AND STANDARDS

This manual has been prepared in conformity with:

- Enclosure "I" to directive 89/392/CEE and amendments thereof.
- UNI EN 292/2 – 1992.

1.4. USING THE MANUAL

NOTE

Keep this manual as long as the machine is used.
Make sure that all updates are promptly included in the manual.
As it forms an integral part of the machine, it should always follow it, inside the firm where the machine is used or elsewhere.

This manual consists of two sections. The first section, the pages of which are identified by Roman numerals (e.g. I, II, III, IV...etc.), is composed by:

– the Title Page;

– the addition and change registration;

– the Table of Contents.

Through this section, the user can identify the publication and its update level. The table of contents allows to find the desired topic in the manual.

The second section, the pages of which are identified by Arabic numerals (e.g. 1,2,3,...n), provides the sterilizer operating and maintenance instructions. Read all this manual, page after page. Learn and remember all warnings.

As the operator should be qualified for using sterilizers, all general information and instructions they are acquainted with have been omitted.

All operations require great care and caution. Throughout this manual, the following ”warnings” inform the user about difficult and dangerous operations.

NOTE

Indicates important information pointed out outside the text.

WARNING

Indicates a condition in which lack of caution or wrong procedures are likely to damage – also irreparably – the sterilizer.

CAUTION!

Indicates a dangerous situation for people.

In addition to these general warnings, this manual includes other special symbols, printed throughout its pages, similar to the symbols applied to the machines by means of plates and/or decalcomania in order to indicate dangerous areas and behavior.

Before approaching the machine to start any operations and maintenance jobs, carefully read the above mentioned warnings and instructions and understand them.

Carefully keep this manual. Handle it with care and do not damage its content, even partially.

The operator must promptly replace the manual or any lost, damaged or completely/partially illegible plates, stickers etc. applied to the machine.

NOTE

Do not remove, tear or re–write this manual or its sections. In case of operations or situations other than those described in this manual, do not hesitate to contact the manufacturer for any updates. Keep the manual in a dry and cool place.

1.5. UPDATES

Any updates may be communicated to the machine owner using single sheets, complete with all instructions required to add them to the manual.

Should the sterilizer be sold, its owner must notify FEDEGARI about all related references, so that the manufacturer will be able to deliver any additions/updates to the new owner.

2. INTRODUCTION

2.1. IDENTIFICATION

Figure 2.1 shows the facsimile of the sterilizer CE identification plate.

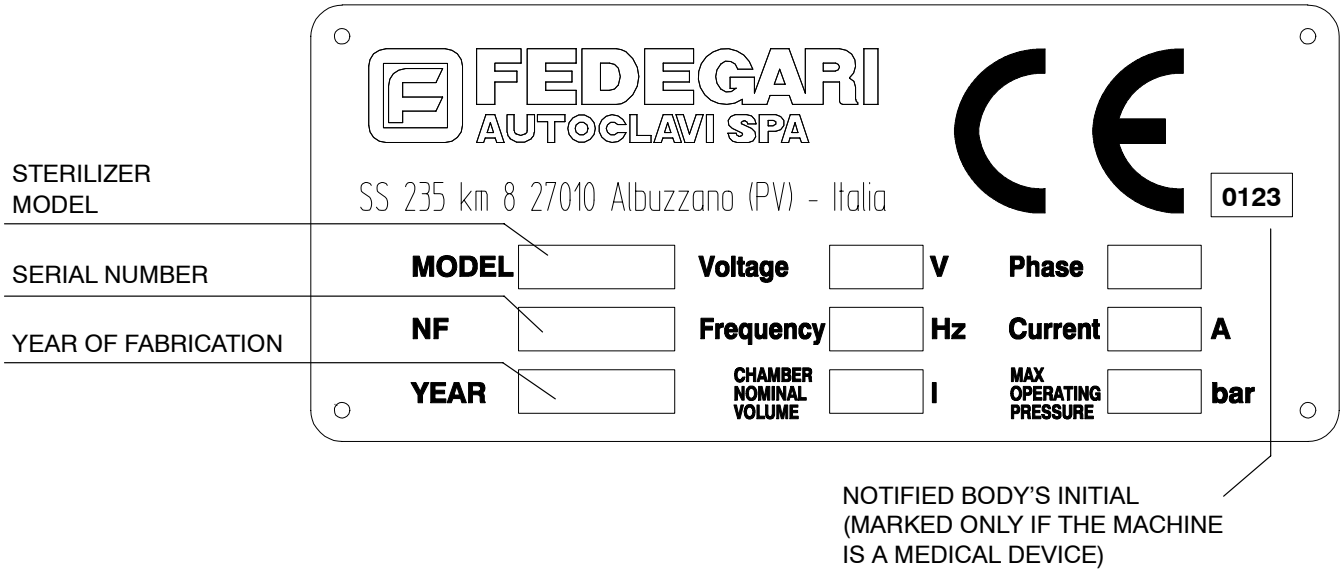


Figure 2.1 – CE identification plate

2.2. SERVICING

FEDEGARI is always at its customer's disposal, whether directly or indirectly through its agents/local dealers, for any operations required. Suitable equipment and specialized personnel are available for overhaul and servicing. Please ask FEDEGARI AUTOCLAVI S.p.A SS.235, km 8 – 27010 Albuzzano (PAVIA) – Italy, for the names and address of FEDEGARI SERVICE CENTERS in Italy and abroad.

This machine is guaranteed according to the Sales Agreement General Conditions.

The guarantee will no longer be valid:

- if the machine is repaired without the consent of the manufacturer or of FEDEGARI Service Centers ;
- when using spare parts other than the original ones;
- should the machine be used for any operations other than those recommended;
- in case of non–compliance with this manual's instructions.

WARNING

FEDEGARI cannot be held liable for any failures and operational faults due to non–compliance with preventive maintenance suggested by the manufacturer and indicated in this manual.

2.3. RISKS DERIVING FROM USING THE SOFTWARE

The use of the software supplied by Fedegari together with its products is licensed to the customer, who will be fully responsible for it (see also the General Terms of Sale).

CAUTION!

Fedegari or its representatives cannot be held liable for direct/indirect damage deriving from using the software, from its failures or the above mentioned license.

2.4. SAFETY WARNINGS

2.4.1. General warnings

CAUTION!

Most labor accidents are due to non–compliance with safety rules.
All operators using the sterilizer must know and comply with the rules mentioned in this manual and on warning plates.
Always observe the rules recommended below.

CAUTION!

Some electrical circuits of the machine remain supplied also when the master switch is off (in the ”0” position). These circuits are located inside the electrical board and are adequately indicated.

CAUTION!

Do not inhibit the machine safety devices. When safety is not assured, all operations are allowed only to FEDEGARI’s personnel, or, with the manufacturer’s authorization, to the user’s trained staff.

CAUTION!

Before using the sterilizer, ALWAYS check that the materials to be processed are compatible with the cycles and steps of the sterilization program to be started.
Make sure that the materials are free of molecular instability risks which, during product handling or processing, are likely to cause explosions.

CAUTION!

Do not perform any kind of jobs and changes on the machine and its fittings.
Do not modify the sterilizer parts in order to fit other devices.
In case of malfunctioning/accidents due to non–compliance with the above mentioned instructions,

FEDEGARI shall not be liable for the related consequences.
Do not hesitate to contact FEDEGARI whenever changes to the machine are required.

CAUTION!

CAREFULLY position the heat probe used also as a safety device for chamber opening temperature, according to the following instructions.
Pay attention to the temperature displayed as:

* **when the heat probe is placed between – not inside – the bottles of one of the lowest batch layers, the heat probe can detect the sterilization chamber temperature.**
  Therefore, always TAKE INTO ACCOUNT that the time required by bottle liquid to reach the temperature displayed by the heat probe is directly proportional to the bottle volume.
  For 50 cc bottles, the safety margin is 30° C (for larger bottles, this margin is to be increased) and the chamber must be cooled at a temperature not below 40°C, so that the bottle internal temperature is 70°C, which is an acceptable value.

* **When placing the heat probe inside a bottle, plunged in its liquid, safety limits are not needed, although the sample bottle could be broken during its processing.**
  In this case, the heat probe will indicate the chamber temperature instead of the bottle temperature. Therefore, before opening the sterilizer, the operator MUST check that the heat probe placed inside the chamber is indicating the temperature based on the safety margin mentioned in the previous section (about 40°C).

CAUTION!

When extracted from the machine, bottles having an internal temperature of more than 70°C could explode, thus jeopardizing the operators.
The maximum safety temperature allowing to open the cover must be set at <70°C and parameter ”CHECK FINAL T” must be enabled by setting value ”1”.

CAUTION!

Thermal sterilization in the presence of low–boiling liquids (i.e. with steam tension higher than the water tension at the same temperature) and/or liquids flammable in the air (i.e. characterized by a ceiling of concentration in the air above which a fire may propagate) involves two kinds of hazard.

* **At the temperatures typical of thermal sterilization (i.e. at least 105°C) a low–boiling liquid can develop such a high pressure that the safety valve opens, letting any gas and/or steam out of the sterilizer, or preventing the correct performance of the sterilization process. For example, the presence of alcohol in a closed room causes a partial pressure, in the aeriform phase, of approx. 4.5 absolute bar at the traditional temperature of 121°C. This pressure depends only on temperature and is not affected by the quantity of alcohol. When the regulation of a saturated steam sterilization occurs ”in temperature”, at 121°C, the pressure tends to reach approx. 6.5 absolute bar, and the safety valve opens well before reaching this value. When the sterilization is regulated ”in pressure”, the pressure developed by the low–boiling liquid simulates the**

reaching of the regulation pressure, preventing the supply of steam to the chamber; the temperature reached at the regulation pressure (3.50 absolute bar in case of decontamination cycles with Fedegari FOB and FVA sterilizers) is not 121°C, being just above 100°C. The process may indefinitely stop in the heating phase. Therefore, the presence of any low–boiling liquid may result in the hazardous release of contaminated material from the chamber or in the impossibility to carry out the sterilization.

* The eventual flammability of the liquid involves, of course, a fire hazard. The concentration of flammable vapors in the air, as necessary for ignition, decreases based on temperature, while the true concentration increases according to it. In most cases, a fire may break out due to the level (even negligible) of static electricity entering with the vapor or, most frequently, with the cooling air. Also in those cases that, at present, are well–known, the damage has been limited to the interior of the sterilizer (that, of course, is shut–down), though it cannot be denied that the possible opening of the safety valve may propagate fire also outside it. A similar hazard is present when vacuum is applied at the end of the sterilization process. The flammable mixture is sucked by a machine not meant for it and any cause of firing may have serious consequences, that cannot be calculated.

CAUTION!

Before starting a sterilization cycle, make sure that the manual pressure relief valve is perfectly closed.

CAUTION!

C02 fire–fighting means are recommended in order to provide preventive protection.

WARNING

Always assure that:

* **the supply voltage to the sterilizer is constantly kept within ±10% of the nominal value required.**
* **The compressed air pressure to the sterilizer pneumatic circuits is stable, within ±10% of the nominal value required.**
* **the saturated steam pressure oscillation for the sterilization chamber is kept within ±10% of the nominal values required.**
* **the pressure of water feed line to the sterilizer is kept within ±10% of the nominal values required.**

Failure to comply with these recommendations may cause malfunctions during the sterilization cycles and damage the machine.

WARNING

Do not use alcohol, petrol, other solvents or acid reaction substances for cleaning or washing the chamber or the sterilizer components, as they are likely to attack stainless steel surfaces and

elastomer parts.
Use water, also slightly diluted with neutral detergents, according to this manual's maintenance instructions.

CAUTION

To avoid cuts during maintenance of the air circulation fan in the sterilization chamber, do not disassemble the fan and motor protections unless the plant is completely isolated from power supply sources.

WARNING

For any kind of processes, especially in case of manual operations or dangerous processes (e.g. decontamination), Fedegari guarantees the sterilization carried out by its machines provided the process manager authorizes proper performance of all cycle phases envisaged for the product, by signing the document printed by the sterilizer control system for approval.

CAUTION!

Do not use the sterilizer and its fittings to perform jobs other than those permitted and specified in this manual.

CAUTION!

These sterilisers are not electromedical devices.
If they are installed near medical or surgical operation areas, they must never be placed at less than 2.0 metres from the patient for the entire period of the operation.

Figure 2.2 shows the warning plate position on the machine, pointing out any potential dangers.

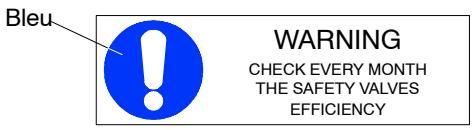
Symbol/Plate name	Plate position	
General danger 	*1* *2* *3* *4* *5* *6*	USERS SAFETY VALVE(S) VENT PIPE COVER OPENING/CLOSING KNOB – MASTER SWITCH MANUAL PRESSURE RELIEF VALVE OF THE CHAMBER CHAMBER'S PRESSURE RELIEF PIPE
heck safety valve on a periodical basis  	*1* *2* *3*	INSIDE THE TECHNICAL CABINET PANEL AT THE REAR OF THE ELECTRICAL BOARD REAR PANEL NEAR THE SAFETY VALVE(S) VENT PIPE
Hot surfaces 	*1* *2*	MACHINE CASING AUTONOMOUS STEAM GENERATOR (with option K10)
Electrical hazard 	*1*	ELECTRICAL BOARD

Figure 2.2 – Plates indicating potential dangers

2.4.2. Machine state

This machine allows for three different operating modes.
The first one (USE) allows to give the machine simple orders, while checking it in full safety, from its starting to process completion, as well as to obtain the reports and/or messages confirming successful process performance.

The second operating mode (CONFIGURATION) allows to reconfigure the machine applications (sterilization programs), while defining the general parameters controlling the activities and functions common to all sterilization processes.

The third operating mode (MAINTENANCE) includes all operating modes allowing to service and/or control (also " ON LINE ") several software functions and the functional operating logics controlling the sterilizer.

2.4.3. Operators

When analyzing the works described in this manual, concerning the machine life cycle steps, FEDEGARI has taken into account the operator's qualities.

2.4.3.1. Operators' qualification

Please find below a profile about the professional qualities required to each operator using the sterilizer.
The operator:

- Must know the physical and chemical principles concerning gas, fluid and liquid dynamics during sterilization processes;
- Must be acquainted with environmental and behavioral problems, to protect the environment and other products from microbiological and particulate contamination;
- Must thoroughly know the operating principles of the machine, its structure, main blocks as well as the allocation of the control units allowing to disconnect the machine from its main supply sources;
- Must be properly trained for all operations required to start and control the plant and able to record the sterilization data, also referring to the workmanlike manufacture rules in force in the country where the machine is used;
- Must be properly trained to evaluate all events occurring during the sterilization cycle;
- Must be properly trained to evaluate any alarms activated during the cycle;
- Must be properly trained for stopping the machine in case of an emergency (also concerning the batch);
- Must be properly trained and able to perform the preventive and corrective maintenance required for operator interface performance.

CAUTION!
This recommended profile is to be integrated with other professional skills required by the rules in force in the country where the machine is used.

2.4.3.2. Personal protection means

Based on the batch to be processed, the operator must protect his body against the direct or indirect influence of chemicals (whether organic or not) or microbiological elements (e.g. viruses, bacteria), forming the batch to be sterilized or aggregated to it.
These substances can be noxious by contact, inhalation or contamination.

Always wear suitable protection means, such as masks, suits, gaberdines, gloves, protective glasses, footwear, boots etc...

CAUTION!

The operator MUST be allowed to check the batch before its delivery, to verify the type of material included.

CAUTION!

The operator must wear suitable work clothing, to be protected against chemical, physical and/or microbiological risks, deriving from contact with a wide range of materials, including gases and liquids.
The work clothing material and structure must be fit for protecting the operator against any contact/contamination dangers.
The buyer is responsible for the use of highly protective means suitable for the type of product to be processed, in compliance with the rules in force in the country where the machine is used.

WARNING

All personal protection means must permit the operator to move freely in order to carry out the necessary operations and to properly see with the best angulation and limited sight distortion.
Use only certified protection means. All protection means must be carefully used and kept (e.g. wear them correctly, tighten the related closing systems, replace mask filters etc.).

WARNING

Personal protection means are sometimes recommended in order to protect the processed product against contamination (e.g., during unloading operations).

To treat products free of chemical or microbiological risks:

- Wear a waterproof cotton one–piece suit or other work clothing, allowing for good transpiration and covering the whole body, except for your face;
- Wear suitable, comfortable shoes, for proper mechanical protection from spilled liquids;
- Wear light, protective glasses against sprays. They should not be made of glass, without fragmentation danger, transparent with the best refractive index, visual angulation and low distortion.

2.4.4. Recommendations and precautionary measures to be adopted by the user

The user must fit the installation area with suitable lighting devices, complying with safety and accident prevention rules.
The user must assure that the area before the sterilizer is provided with an antislip flooring, in aggregate or polymeric materials, easy to wash and fit for chemical and thermal disinfection.
The floor must be fit for any processing, according to the products to be sterilized.
Clear and legible warnings must be installed near the work station, to prevent unauthorized personnel from entering the work area.
Before delivery, the user must train its operators and make sure that they are acquainted with the machine and able to carry out the necessary operations, according to the skill profile mentioned in section
2.4.3.1.

2.4.5. Emergencies

The user must fit the area with proper fire–fighting stations.

CAUTION!
C02 fire–fighting means are recommended in order to provide preventive protection.

In an emergency, the operator must be free to reach the main switch and the primary feed shut–off valves.

Electric system black–out

In case of black–out, the main switch is activated to isolate all downstream elements.
All processes started before the black–out will be stopped.

When the electric power is restored, after resetting the main switch, the sterilizer enters an emergency state, waiting to receive a manual control which brings the sterilization process to the cycle end phase or to the Emergency–Decontamination phase, after an electrical blackout has occurred, during the ”Heating” or ”Sterilization” phases, in the Decontamination Program.

The sterilization chamber features a pneumatic cover seal and the related devices, which assures chamber tightness also in case of pneumatic or power failure.

Depressurizing the door pneumatic seal takes more than depressurizing the chamber.
The atmospheric pressure inside the chamber, caused by sealing failure due to a black–out, is reached after at least 20 hours, based on the machine maintenance level.

Pneumatic, steam and water supply failure

All supply line failures are detected by proper sensors and could considerably increase the time required to complete the steps of the process in progress.
The sterilizer enters an emergency state, waiting for the reset of suitable parameters.

Emergency stop

Press the ”EMERGENCY” mushroom–head push–button to stop power supply to the machine by means of the main switch. Refer to the instructions of item ”Electric system black–out”.

3. GENERAL INFORMATION

3.1. GENERAL DESCRIPTION

3.1.1. Foreword

FVA vertical steam sterilizers are flexible and high–performance small–sized semiautomatic machines for sterilization processes to be carried out in laboratories and hospitals (where they are not use as production equipment).

3.1.2. Main components

The sterilizer (see Figure 3.1) consists of the following main components:

- Sterilization chamber;
- Cover and related sealing system;
- Technical cabinet complete with a shutter covering the electrical board;
- Electric system;
- Hydraulic and pneumatic installations;
- Operator panel;
- PLC electronic process controller console;
- Additional components (optional);
- Fittings for product loading/unloading;

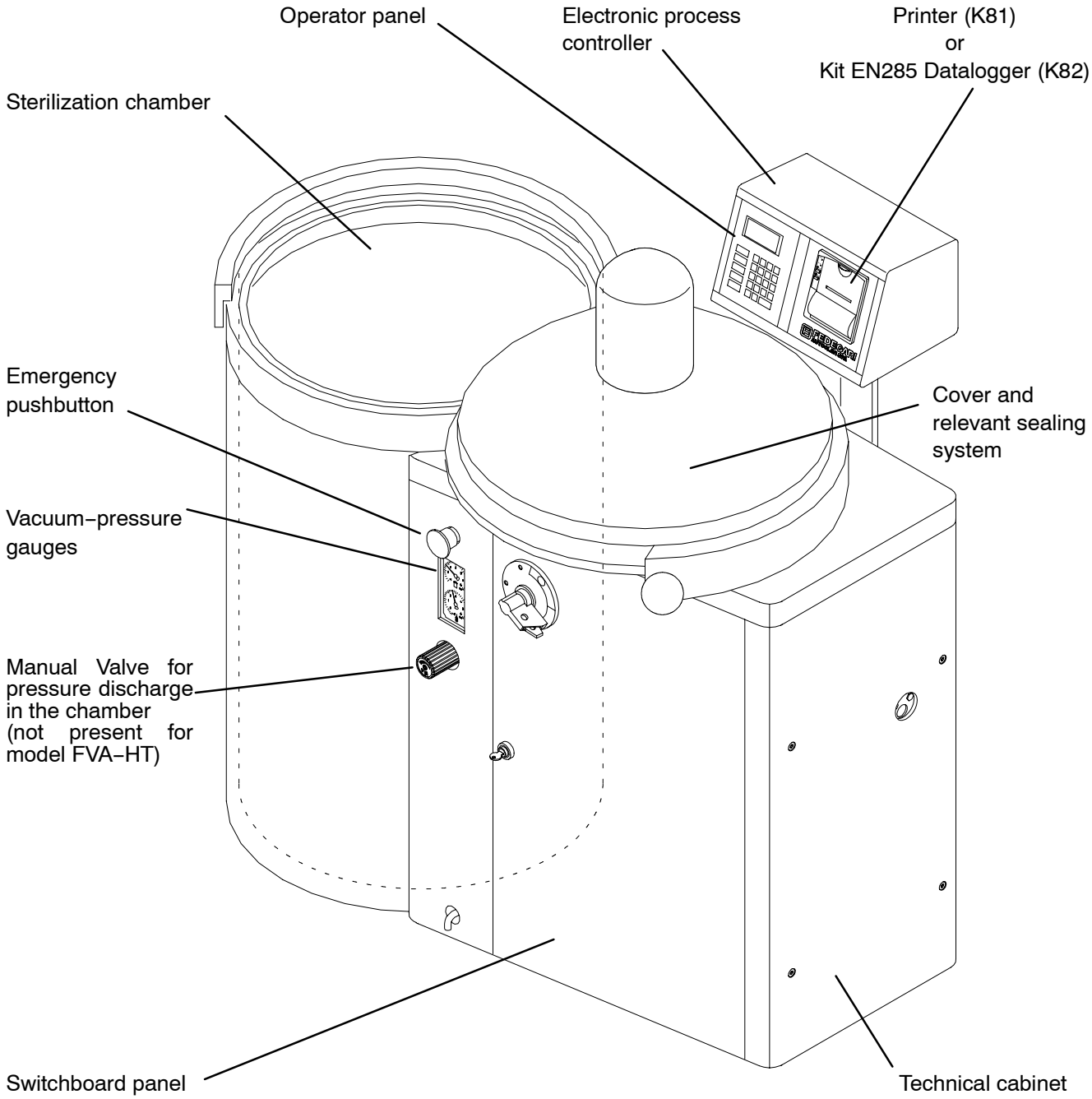

Operator panel
Electronic process controller
Printer (K81) or Kit EN285 Datalogger (K82)
Sterilization chamber
Emergency pushbutton
Cover and relevant sealing system
Vacuum–pressure gauges
Manual Valve for pressure discharge in the chamber (not present for model FVA–HT)
Switchboard panel
Technical cabinet

Figure 3.1 – Main components of the sterilizer

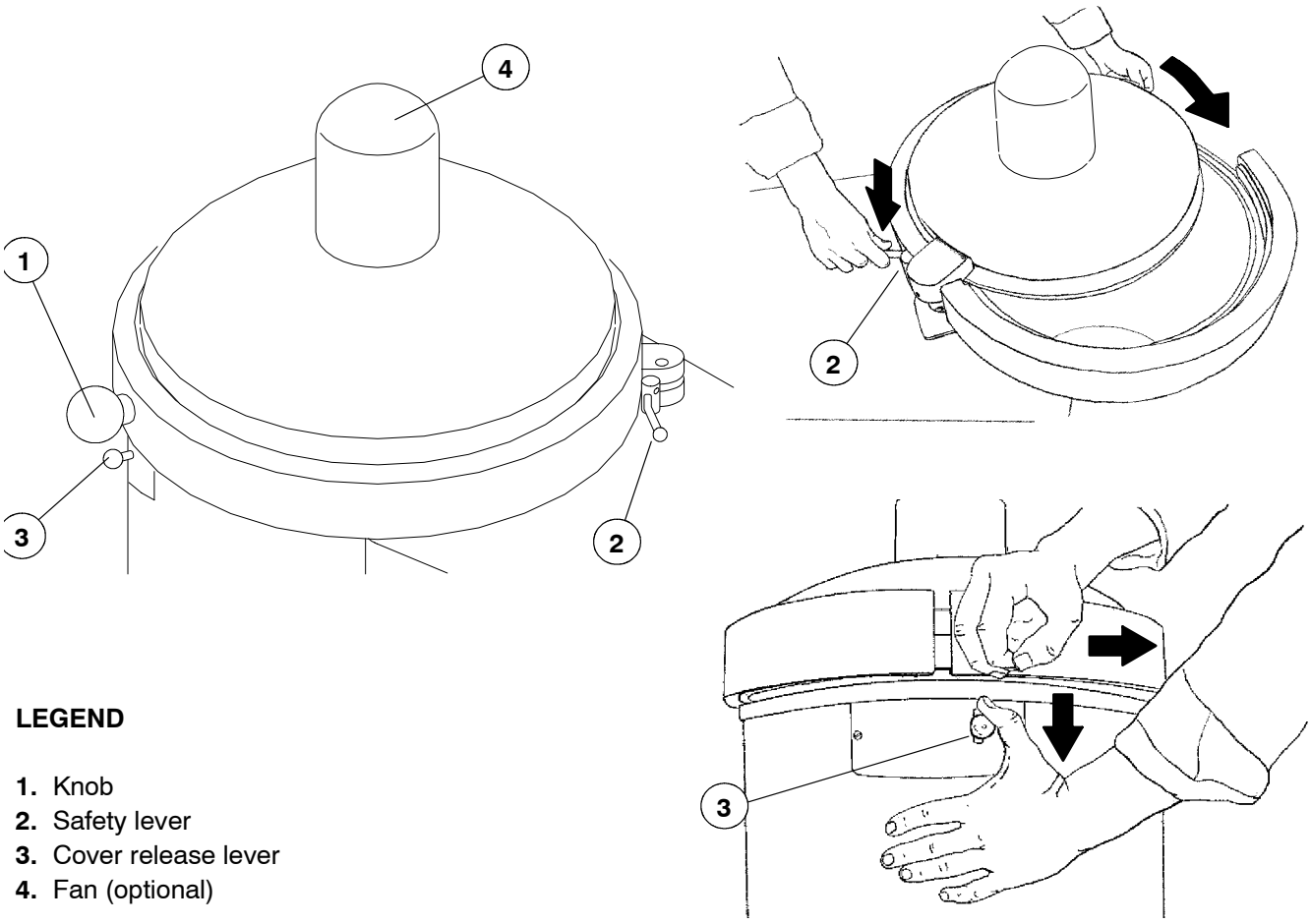
3.1.2.1. Sterilization chamber

The pressurized sterilization chamber features a cylindrical section and a vertical axis, and houses the material to be processed. The purge system on its bottom collects the condensate to be drained. The chamber is in AISI 316Ti gloss finished steel with Ra < 0,19 mm surface roughness

3.1.2.2. Cover and Sealing system

Cover

The horizontally rotating cover (see Figure 3.2), in position "Closed door" is coupled with the chamber through a "C" band which, even under minimum pressure inside the chamber prevents the cover from rotating and opening.
The chamber cover is fitted with a horizontally rotating knob (pos. 1) for easy opening and closing,. When closing the cover, a safety lever (pos. 2) positioned on its top, is moved by the operator with both hands, to prevent damaging his fingers. Once closed, the cover can be opened by lowering the lever (pos.3), which releases a safety device.
The particular profile of the cover allows you to install a special (optional)fan, with magnetic joint (pos. 4), to be used for specific phases of batch cooling.



LEGEND

1. Knob
2. Safety lever
3. Cover release lever
4. Fan (optional)

Figure 3.2– Cover closing system

Sealing system

The sealing system consists of a silicone rubber seal. To seal the sterilization chamber when the cover is closed, supply the seal housing with compressed air. The seal is pushed outwards and pressed against the cover.

3.1.2.3. Technical cabinet

The external cabinet, in polyurethane resin and featuring an AISI 304 stainless steel frame, includes the hydraulic, electric and pneumatic installations, the process electronic controller components and, according to the machine configuration, the autonomous steam generator, the vacuum pump and other optionals.

3.1.2.4. Electric system

The sterilizer electric system complies with EN61010–1, EN61010–2–041, EN60204–1 European standards.

The electric circuit is fitted into a suitably ventilated box, which can be easily reached from the machine front.

The plant includes all control lines of electrohydraulic or electropneumatic actuators of the motors, of the electronic process controller, of the autonomous steam generator, if any. The plant connects the process controller to all sensors and transducers (e.g. pressure switches, heat probes etc.), as well as to the operator interface devices. It also provides for the primary feed line and its protection plant.

3.1.2.5. Electric board

The electric board is located in front of the machine cabinet and lodges the main electric and electronic feeding/disconnecting devices, as well as the distribution equipment, including the main switch. This switch features a release coil allowing to open it, should the protection devices be activated, and to disconnect power supply to the machine.

3.1.2.6. Plumbing and pneumatic plant

The plumbing and pneumatic plant (see the P&ID scheme) consist of pipes, solenoid valves, pneumatic and electropneumatic valves. The hydraulic plant is in AISI 316L stainless steel and is fitted with small sanitary flanges, with the related closing clamps for connecting each element and suitable elastomer seals.

3.1.2.7. Operator panel

The Operator Panel, located on the top of the cabinet, consists of a LCD 4 lines, 20 columns display and of a membrane keyboard, through which the operator manages the interactive dialogue with the machine. It also features RAM , with emergency power supply and FLASHEPROM for the user program, a serial port for the printer interface and a RS 232 serial port for PLC interfacing.

3.1.2.8. Electronic process controller

The electronic process controller consists of a programmable logic controller (PLC) which, together with specific hardware blocks and other electronic equipment, controls the machine as well as all operations regarding the interactive dialog with the operator.

It features 16 digital inputs/outputs, RS232 serial port for interfacing with the operator's panel, RAM with emergency power supply. The controller can use EPROM or EEPROM and features another RS232 serial port to transmit the cycle data to an outer system (master), with a well–defined ASCII protocol.

The control software is certified according to IEC1131–3 standards.
The controller:

- manages the dialogue with the operator through the interface devices;
- controls the hydraulic/pneumatic plant actuators;
- detects the system logics from the field (electric and hydraulic/pneumatic plant), based on the confirmation of set activations;
- detects the analog values of pressure and temperature measurements carried out, through specific modules converting the analog signal from temperature and pressure sensors into a PLC–readable digital signal.

The process controller consists of the following units:

A PLC Matsushita FP–M–C32TC 5K–DC24V;

B Operator panel EXOR R&D T–line TCP01R–04–0245;

C Printer CUSTOM FT190SP;

D Module TECNA ADPLC/F32, converting analog signals into digital signals, with a minimum of 2 digital input and output lines, for the direct reading of a 4÷20 mA sensor and of two 4–wire heat probes Pt100.

E Expansion card provided with 12 inputs and 8 digital outputs;

F Datalogger CUSTOM FT190DL (K82).

Figure 3.3 shows the functional connections between the main blocks forming the process controller.

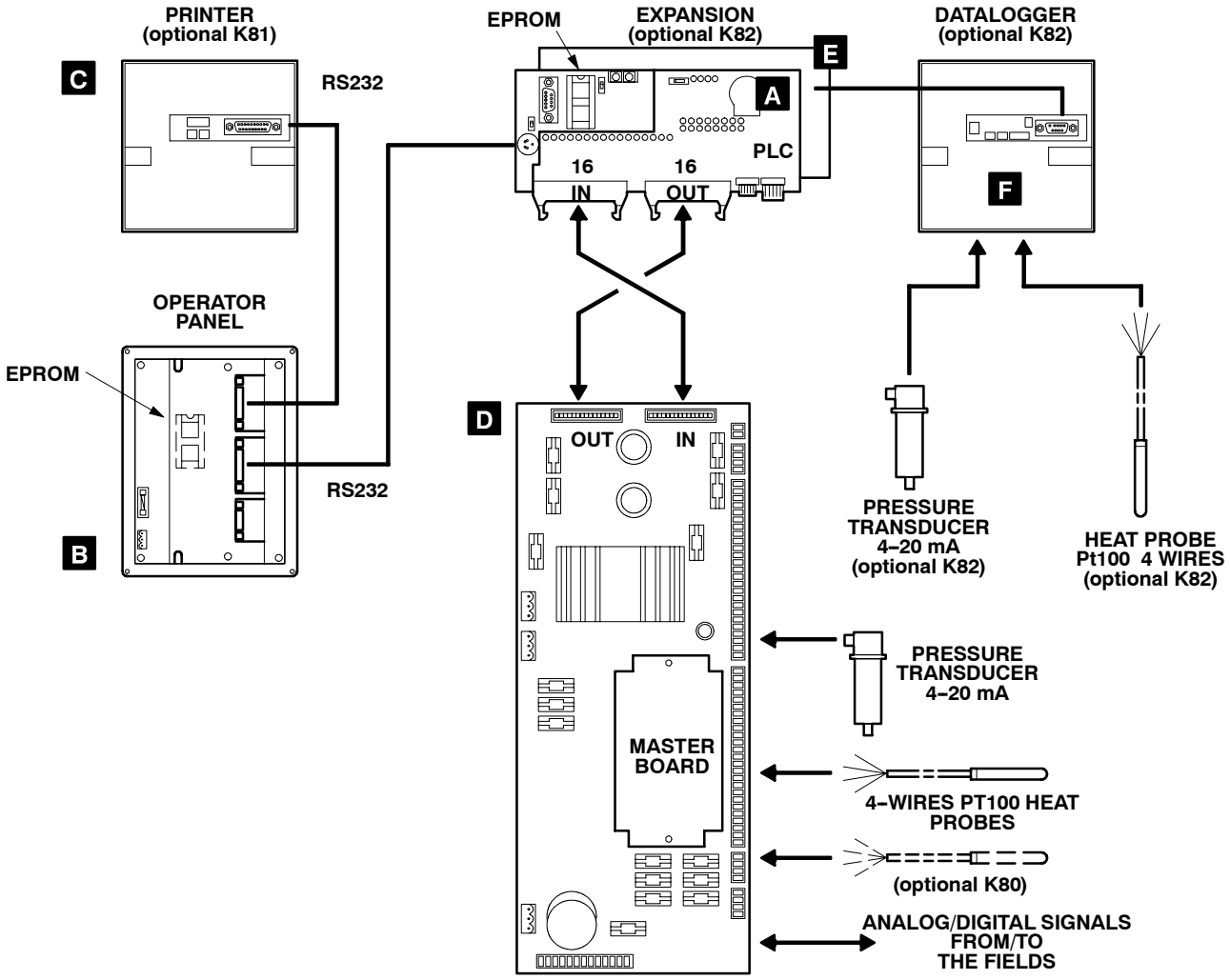


Figure 3.3 – Process electronic controller–functionals connections

3.1.2.9. Main additional components (optional)

Main optional components:

- Steam generator;
- Vacuum pump;
- Effluent cooler;
- Air electrocompressor;
- Air sterilising filter;
- Network compressed air supply unit;
- Quick cooling unit;
- Spontaneous cooling;

- Pressurized chamber leak test;
- Decontamination cycle;
- Steam supply deflection unit;
- Additional heat probe;
- Process printer;
- Control function F_0;
- Secondary RS232 serial output;
- Datalogger;
- Deionizer.

Steam generator (K10)

The steam generator is installed when no saturated steam is available to feed the sterilizer, or when the quality of the available steam is poor. The steam generator consists of pressurized reservoir **D001**, in AISI 316 stainless steel, supplied with deionized water evaporating by means of three electric heating elements **RX02** fitted on the top of the reservoir. The loading of deionized water, supplied by the feed network and by a proper container through an electric pump **PA01**, is controlled by solenoid valve **E009**, which opens pneumatic valve **S009**. Check valve **R004** prevents water from flowing to the pump. Pressure switch **P004** detects pressure inside the generator, checks the heating element power supply and warns the process controller when the pressure reached allows to supply the chamber. Sensors **L001** and **L002** detect the water level inside the pressurized body.
The steam generator is also fitted with the following devices, for the pressurized reservoir operational safety:

- Manual discharge valve **V004**;
- Safety valve **Y002**;
- Pressure gauge **M003** detecting reservoir **D001** pressure, clearly visible to the operator;
- Thermostat **T002**, controlling the heating element temperature and signaling dry operation;
- Thermostat **T003**, if required, checking the generator maximum temperature (TÜV).

Vacuum pump unit (K20)

It consists of a liquid ring pump **PV01**, fed by the network water. Water enters the pump through solenoid valve **E011** and is regulated by valve **V003**. Valve **V007** adjusts the air ballast necessary to the vacuum pump through the air intake. Solenoid valve **E011** opens when the motor is energized.
The pump is used to create continuous as well as discontinuous (impulse) vacuum in the sterilizer chamber.
This pump is required whenever air cushions in the batch could prevent its sterilization, as well as for product drying.

Effluent cooler (K30)

Effluent cooler **W001** consists of a small mixing reservoir, fed by network water. The drain line condensate and gases are sent to the reservoir before being discharged outside the machine. The cooling system is regulated by thermostat

T004 and solenoid valve **E001**, located on the network water feeding line. The cooler is used in order to lower the effluent temperature (up to 60°C) before letting it outside the sterilizer.
The cooling unit must be fitted whenever low temperature effluent is required, e.g. when the regulations of the installation site do not allow for high–temperature effluent, or when the drain lines connected to the sterilizer are in plastic material, which is likely to be damaged by high temperature.

Internal air electrocompressor (K40)

It can be fitted into the machine cabinet, to be used when no network compressed air is available.
The electrocompressor model and the related plenum chamber must be chosen based on the machine configuration.
If the sterilizer is not used to process liquids, compressed air is only needed to feed the cover seal and the pneumatic valves. A 2 liters plenum chamber is sufficient to guarantee proper operation.

External Air electrocompressor (K43)

When the machine is used to carry out sterilization processes requiring compressed air, an external compressor must be installed featuring a plenum chamber with more than 10 liters capacity.

Sterilizing filter for air (K50)

The air filtering unit consists of a filter **F007** which can be sterilized in the sterilizer, with 0,22 mm retention, fitted in a plastic container.

Network compressed air supply unit (K51)

This unit consists of solenoid valve **E010** and pressure reducer **VR02**, which supplies the chamber with sterile compressed air. This unit must be installed on the sterilizer when the batch to be sterilized requires an air counter–pressure on completion of the sterilization process.

Quick cooling unit (K52)

The quick cooling unit basically consists of a magnetic fan **CV12** and a heat exchanger located in the cover concavity. They are installed so that the sterilization chamber volume is not reduced. The fan coupled to the motor **ME12** through a suitable magnetic joint must assure air circulation inside the chamber. Air is cooled when coming into contact with the surface of the heat exchanger, supplied by network water. This procedure allows to reduce the liquid cooling time and to increase the sterilizer performance. The quick cooling unit is recommended whenever the sterilizer is used to process heat–sensitive liquids, in particular when they are stored in large bottles.

Spontaneous cooling (K53)

This option allows the ”Slow spontaneous cooling” of the load.
It requires the use of load interception electro–valve E007, that during the ”Spontaneous cooling” phase remains closed until the pressure inside the chamber is lower than/equal to the average of maximum and minimum balancing pressures.
The opening of the valve allows the discharge of the condensate produced during the cooling phase. The phase ends

as soon as the target Temperature is reached.
During the "Spontaneous cooling" phase, the pressure inside the chamber reaches balancing pressure values spontaneously, without creating a pressure drop that is likely to damage the batch, if consisting of liquids contained in reservoirs.

NOTE

The presence of option K51 "Newtork compressed air supply unit" or option K52 "Quick cooling unit" (including K51), disables the effect of option K53 "Spontaneous cooling", that in these cases is not enabled.

Pressurized chamber leak test (K61)

This option is used to perform the pressurized chamber leak test. It consists in shutting–off the discharge, usually connected to the chamber through a calibrated orifice. This test can be performed as an alternative to vacuum leak test in sterilizers lacking the necessary equipment. To carry out the pressure leak test, the machine must be fitted with the air supply unit in counterpressure (K51).

Decontamination cycle (K62)

This cycle is installed on the machine in order to sterilize products involving microbiological pollution risks. During the sterilization phase, start solenoid valve **E071** to let saturated steam in, either through the chamber purge system or directly through **S008**. The chamber and the purge system must have the same temperature. Solenoid valve **E007** is closed until completion of the sterilization process. Therefore, the sterilization chamber batch must not be removed until the process is completed, i.e. when the chamber content has been sterilized. The maximum allowed temperature is 121°C, equal to a 3.4 bar pressure with air/steam mixture.

Steam supply deflection unit (K70)

This device allows to selectively feed a sterilizer featuring an autonomous steam generator (K10), also with network steam. The operator enters a process controller parameter for manually deviating a three–way valve **V009** inside the sterilizer technical cabinet.

Additional heat probe (K80)

This Pt 100 heat probe **T005** is identical to that fitted on the sterilizer chamber. It can be connected to the process controller, which will provide for the second temperature measurement, to be printed with the first one, or to an optional external recorder.

Process printer (K81)

It is an alphanumeric printer installed next to the operator interface, in order to print detailed process documents. The printer is provided with a 200 dpi thermal printing mechanism, uses 57.7mm wide paper and is connected to the controller through a RS232 serial output.

Secondary RS232 serial output (HW1)

This option consists of a special software version loaded on the process controller, which enables the second PLC RS232 serial output. It can be used to download in real time all data of the process in progress to a remote PC, in ASCII format, or to connect a remote PC featuring the Fedegari software CVB–LINK.

Control function F0 (SW1)

For all applications requiring a handling of the F0 value accumulated during the process, instead of regulating sterilisation based on a fixed time; you may obtain an handling of the F0 value accumulated during the process, through the selection of proper parameters. The software begins calculating the Fo values starting from 100°C.

Datalogger (K82)

This device is used for the digital recording of analog signals, and is installed as on option for printing process data (time, temperature and pressure) on thermal paper. Both the data loaded through the serial port and the data acquired by the datalogger through its sensors (heat probe Pt100 and pressure transducer – optional), in recording mode, are considered for printing.

Deionizer (T30)

If the network water available for supplying the steam generator is too hard, in order to ensure better performance and less frequent maintenance jobs, we recommend that you install a deionizer.
This group is mainly made up of a cartridge of mixed bed resin (8.5 l), that can change its tone based on its progressive emptying. Once empty, the cartridge must be replaced with a new one, containing regenerated resin; lhe replacement takes a few minutes and does not require any specific experience.
This model allows the treatment of approx. 750 l of water (with a new cartridge), for an output of 30 l/h; if the water pressure at the inlet exceeds 0.8 bar install a pressure reduced fitted with a pressure gauge on the network, upstream of the deionizer.

Cycle repetition (SW2)

This option allows the repetition of a cycle up to a maximum of 20 consecutive times.

3.1.2.10. Loading/unloading devices

The machine loading/unloading system uses baskets in steel plate, fitted with folding handles (see Figure 3.4).

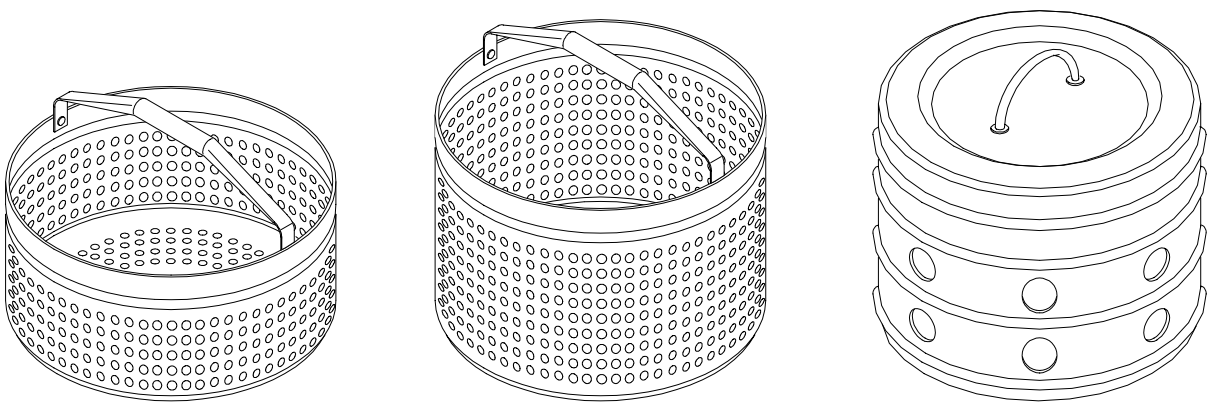


Figure 3.4– Loading/unloading devices

3.2. SAFETY SYSTEMS

3.2.1. Opening/closing system

Initial system state

Before closing the chamber, until the cover has reached the recommended position, limit switch **Z001**, checking the system correct operation, is kept pressed by a spring, and breaks the circuit for compressed air supply to the seal housing, thus preventing pressurized fluids from entering the chamber.

Starting closing operations

For safety reasons, both hands are required to manually turn the sterilizer cover from position **A** to position **B** (see Figure 3.5).

When the cover has reached the position required for closing, limit switch **Z001** changes its state and activates the control for compressed air supply to the seal housing.

Closing the chamber

When the limit switch has selected the cover correct position, the operator must press the closing push–button in order to let compressed air in the seal housing. The chamber starts closing and the cover is blocked.

Sealing system operation

The compressed air pushes the seal upwards and presses it against the cover perimeter, which is lifted from its rest position held by two semicircular brackets.

The seal is pressed against the cover for perfectly closing the sterilizer, thus assuring tightness against pressurized fluids entering the chamber.

Letting fluids into the chamber

Air pressure in the chamber is detected by pressure switch **P002**. When pressure has reached the set value, the pressure switch warns that the chamber is closed and perfectly tight, thus enabling the process cycle and letting fluids into the chamber.

Starting opening operations

The sterilizer can be opened only when:

- the process cycle is completed;
- pressure transducer **P001** connected to the sterilizer control system and electro–mechanical safety pressure

switch **P005** indicate that the chamber internal pressure and atmospheric pressure have the same value again;

– the chamber temperature measured by theat probe **T001** is lower than the set value, so that the temperature of the liquids to be sterilized in glass containers inside the sterilizer is less than their boiling temperature at atmospheric pressure.

Exhausting air from the seal housing

After the above mentioned steps, the operator presses the opening push–button to exhaust compressed air from the seal housing.

Opening the sterilizer manually

After automatic air exhausting from the seal housing, the sterilizer can be manually opened.

LEGEND

1. POS. **A**: Open chamber
2. POS. **B**: Cover in closing position

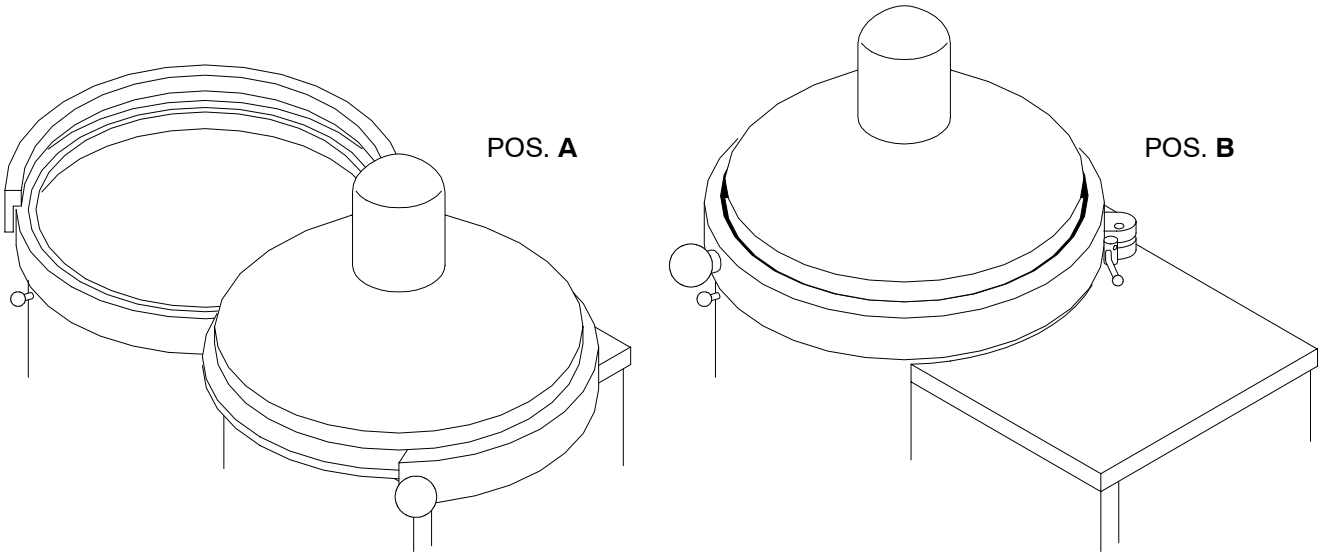


Figure 3.5 – Chamber closure

3.2.2. Safety valves

For the operator protection, the sterilizer features the following devices:

- a safety valve to let out excessive chamber pressure;
- a safety valve to let out admitted excessive pressure (working pressure value).

The valve is mechanically regulated on the maximum allowed value (design pressure value).

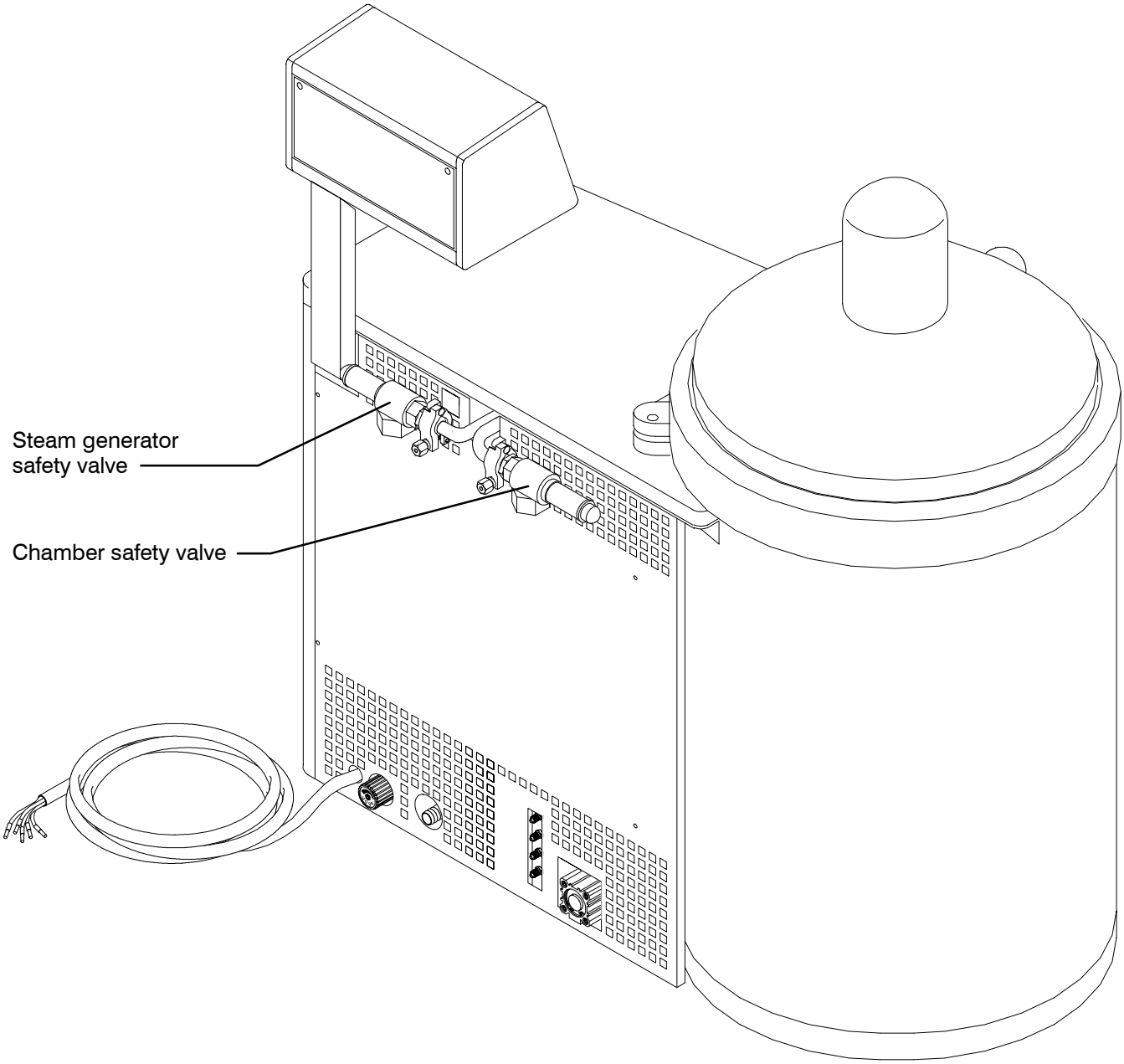
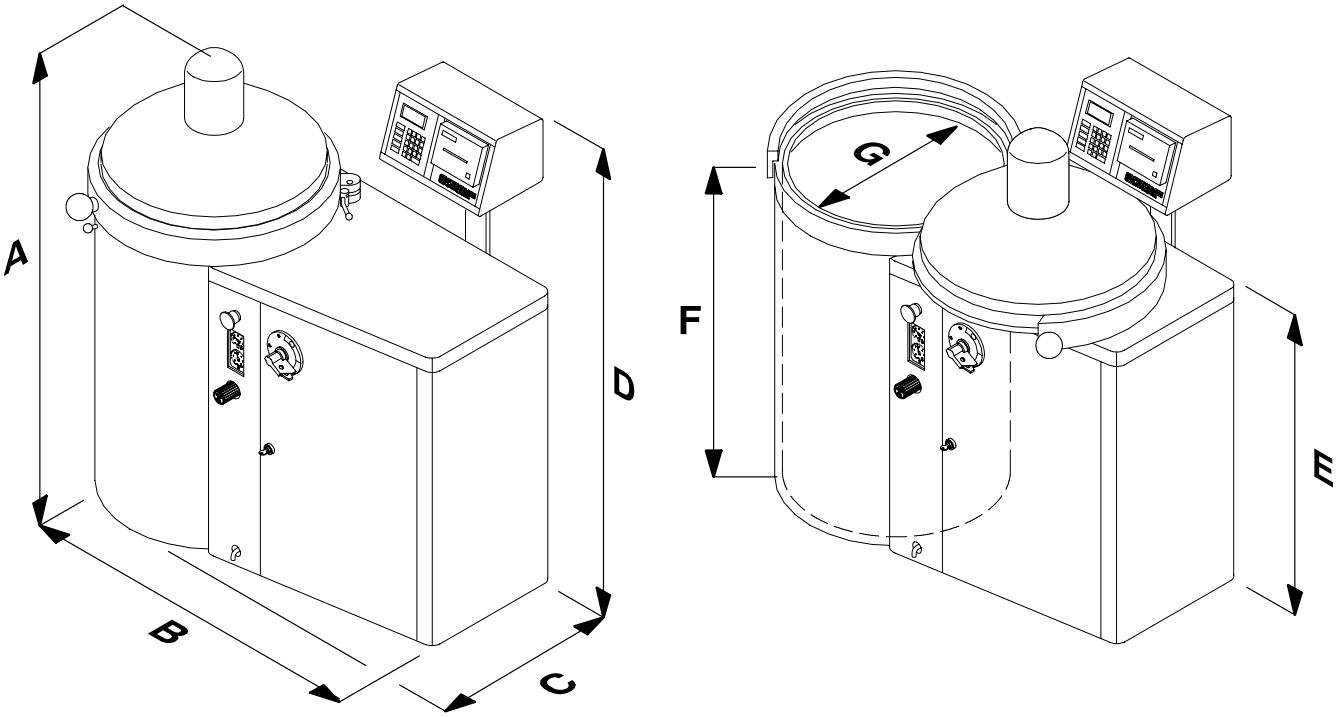


Figure 3.6 – Safety valve disposition

3.3. DATA SHEET

3.3.1. Main dimensions and weights

The main dimensions of the vertical steam sterilizer (models FVA2 and FVA3) are shown in the figure below: (see Figure 3.7).



DIMENSIONS (mm)		
	FVA2 FVA–HT	FVA3
A	1140	1140
B	996	1135
C	500	570
D	1220	1220
E	795	795
F	600	700
G	400	500

	WEIGHT (kg) (*)	WEIGHT (kg) (**)	CAPACITY (l)
FVA2	173	248	75
FVA3	188	328	140

*** With all the options**

**** With all the options and chamber full of water under hydrostatic testing conditions.**

Figure 3.7– Main dimensions and weights

3.3.2. Operational data and main performance

DATA SHEET:

Installation class	II
Pollution degree	2
Sterilization process	saturated steam
Process control	automatic, through PLC
Operator interface	keyboard and 4–line x 20– character displays
Pressure measurement	piezoelectric transducer
Temperature measurement	heat probe Pt100
Chamber closing	horizontally rotating cover with pneumatic seal
Sound pressure level (EN ISO 11202)	< 64 dBA
Max. operating pressure	3.5 bar abs.
Working pressure (Model FVA–HT)	6.2 abs. bar
Working temperature	139°C
Working temperature (Model FVA–HT)	155°C
Voltage	400V triphase + N + PE (standard version)
Frequency	50 Hz
Protection of drive components	IP54
Installed power:	
– without steam generator	1.5 kW
– with steam generator	10.5 kW
Absorption:	
– without steam generator	3A
– with steam generator	18A
Materials:	
– chamber	AISI 316Ti
– valves and piping	AISI 316L

NOTE

In compliance with the requirements of standard EN61010–par. 5.1.3.(C), the power load value indicated on the CE plate refers to the most complete steriliser model, equipped with all optional accessories.

USERS	MODEL FVA2 / FVA–HT	MODEL FVA3
Steam – max delivery (kg/h)	12	12
D.I water for generator – max delivery (l/h)	15	20
Network water (Max. 20°F) – for drain cooling (l/h) ◐ – for vacuum pump (l/h) – for forced cooling (l/h)	 20 200 50	 20 200 50
Compressed air: – for actuators (Nl/min) – for back–pressure (Nl/min)	 10 210	 10 240

◐ : this value may change depending on the cycle configuration and on the type of the load.

3.4. RECOMMENDED USE

CAUTION!

Do not use the sterilizer and its fittings to perform jobs other than those permitted and specified in this manual.

This sterilizer can process both solid and liquid materials, according to the selected configuration, using different sterilization processes.

The machine configuration allows to process:

- Empty glassworks;
- Stainless steel tools;
- Parts of machines;
- Small stainless steel reservoirs;
- Different products, manufactured using materials suitable for this type of processing;
- Liquid and semiliquid culture media (agar) in unsealed reservoirs;
- Several solutions in unsealed reservoirs.

Sterilizers featuring vacuum pumps can process not only the above mentioned materials, but also:

- Porous substances;
- Various packed instruments;
- Solids to be extracted dry;
- Empty containers fitted with filters;
- Filters.

3.5. FORBIDDEN USE

All applications excluded from the previous section are forbidden. Do not use a sterilization program fit for a specific material for processing another type of material. Wet heat processing must be avoided in case of:

- Flammable or explosive substances;
- Non–flammable liquids, with high vapor pressure (halogenated hydrocarbons and similar substances), also in closed containers;
- Bottled/spray cylinder gas (also empty);
- Substances which, when decomposing due to wet heat could generate noxious, flammable, explosive gases or vapors as well as hazardous and flammable residues and solids.

As sterilization is assured by direct or indirect steam contact with the surfaces to be processed, wet heat sterilization processes are not fit for:

- Closed containers, steam–tight, to be sterilized inside (e.g. closed empty vials);
- Closed containers, steam–tight, containing an anhydrous material to be sterilized (e.g. vials containing oily anhydrous solutions and anhydrous powders).

If in doubt, do not hesitate to contact FEDEGARI.

4. TRANSPORT, HANDLING, STORAGE

4.1. GENERAL WARNINGS

CAUTION!

Always disconnect the machine from its power supply before moving it.

Do not move the machine unless it is perfectly stable.

4.2. TRANSPORT

4.2.1. General information

To transport the machines described in this manual, always comply with the following rules.

4.2.2. Transport instructions

4.2.2.1. Packaging

To transport the machine, use the packaging system adopted for its delivery, provided the same carrier is used. In this case, keep the original packaging or replace it if it is no longer available or in poor condition.

The packaging system includes a board to fasten the machine.

Two types of packaging are available, to meet all requirements:

- Paperboard protection box;
- Wooden box.

4.2.3. Specific procedures

4.2.3.1. Warnings

CAUTION!

The machine must not be turned over or inclined during lifting operations.

CAUTION!

Before starting lifting operations, make sure that the means used capacity is sufficient, compared with the required carrying capacity and radii.

4.2.3.2. Lifting the machine packaging

The machine packaging must be lifted in order to load/unload the carriers charged with the sterilizer transportation. These operations require suitable lifting equipment, fitted with forks to handle the board.

CAUTION !
During lifting operations, access to the surrounding area is strictly forbidden.

CAUTION!
Use only suitable and certified lifting means. In Europe, they should feature the EC marking.

Loading

1. Lift the machine packaging with suitable equipment. Check that it is perfectly balanced during these operations and be careful to place it on the horizontal plane of the vehicle used for transportation, without dangerous tilting and shaking.
2. Fasten the board to the vehicle platform by means of suitable ropes, and protect it as it could be damaged when touching such ropes, or using other suitable means.

Unloading

- With a machine fitted with suitable forks, lift the sterilizer packaging. Make sure that it is always balanced during this operation and be careful to place it on a horizontal plane of the unloading area, without dangerous tilting and shaking.

4.2.3.3. Handling on the installation site

Due to its small size, the sterilizer can be transported using a manual lift truck, inside the installation building, in order to reach the chosen position.
The machine is generally positioned by two operators.

Follow this procedure:

1. Unpack the machine by taking it away from the board forming the packaging base. Keep the packaging, which could be used for other transport operations;
2. Transport the machine, which is still forming part of the packaging, to the installation place, and place it on the room floor;
3. Remove the fastening devices;
4. Lift the machine, and remove pallets.

CAUTION!

Before transporting the machine to the installation site using lifts, check their carrying capacity, by taking into account the following weights:

- Machine weight (see the data sheet, section 3.3.1.);
- Board weight (max. 20 kg);
- Truck weight;
- Operator's weight.

CAUTION !

As regards handling, when the machine must be lifted, check that all ropes and lifting equipment comply with the required capacity and, in Europe, with EEC regulations.

4.3. STORAGE

Before its final installation the machine can be stored, for a short time, in a closed an dry place, at a temperature ranging from 4°C to 50°C , relative humidity lower than 80%.

If no suitable rooms are available please ask FEDEGARI to deliver the machine equipped with welded mixed case for boxes by sea.

WARNING

The sun's rays are likely to damage the plastic and rubber components of the sterilizer. Avoid prolonged exposure to direct sunlight.

4.3.1. Short shut–downs

No problems are involved for shut–downs of up to two months.

4.3.2. Prolonged shut downs

In case of shut–downs of more than two months, apply silicone oil on seals to prevent gluing and quick wear. After prolonged shut–downs, check whether seals must be replaced.

5. INSTALLATION AND DISMISSION

5.1. ENVIRONMENTAL CONDITIONS FOR USE

The installation site must be well lighted and aerated. The machine and its control system require the following environmental conditions:

- Room temperature: 10° ÷ 40°C;
- Max. relative humidity: 85% con T ≤ 40°C;

CAUTION!

If the installation site is artificially lighted, check the related devices for compliance with the characteristics required by the law in force in the country where the machine has been installed, as to operators' safety and health. The machine features a LCD display.
Align and position the display so as to avoid reflections and reverberations on the operator's visual plane.

5.2. SPACE REQUIRED FOR USE AND MAINTENANCE

The available space surrounding the machine must allow the operator to perform :

- the necessary movements to use the control devices without difficulty;
- the necessary movements for loading/unloading operations with the accessories supplied;
- the ordinary maintenance, such as cleaning and processing operations;
- the extraordinary maintenance operations.

5.3. PACKING REMOVAL

Special containers (packaging) are used to transport the machine, wrapped in materials assuring protection against bad weather during transportation and short–term storage.

All packaging materials must be carefully removed, without damaging the machine structure and surface.

The sterilizer external cabinet is painted. Keep it with care, to avoid scuffing its surface.

NOTE

When using the machine in another site, keep the original packaging container.

5.4. POSITIONING THE MACHINE

CAUTION!

When installing the sterilizer, carefully follow the instructions of the installation drawing, as well as this manual's instructions.

Do not forget that:

* **the installation room floor must comply with the required capacity, including the additional weight resting on its structure, due to scheduled hydraulic tests.**
* **the connections to the floor must bear a 80°C temperature at least.**
* **all technical safety measures recommended for seismic areas must be adopted in conformity with the related regulations.**
* **All pipes and accessories used for draining the sterilizer service fluids, the lines and fittings for connecting to the control panel and to other sterilizer components must comply with the regulations of the applicable law.**

NOTE

The hydraulic test required by the regulations of the country where the machine is used, to be performed when the sterilizer has been installed with its user, might increase the load and reduce the stability of the sterilizer supporting structure. The installation scheme indicates the machine weight and size.

CAUTION!

When installing the machine DO NOT create structural links with surfaces or elements subject to stress or dynamic load outside the sterilizer. Should such links exist in the installation area, please let FEDEGARI know the related problems before buying the machine.

1. Position the machine, so that it rests on a perfectly flat surface;
2. The sterilizer must be placed on a flat surface, near a fume hood;
3. Place the machine according to the instructions given in FEDEGARI's drawings and installation documents (see Section 1.1.1., allied publications).

5.5. CONNECTIONS TO POWER SOURCES AND SERVICE NETWORKS

5.5.1. Hydraulic connections of the users

1. The hydraulic connection to the users is made by means of flexible hoses (see Figure 1.1).

   This system also requires:

   * hose adapters (ø16 mm) for the purge system;
   * quick–connection ø 6 mm for network water;
   * quick–connection ø 4 mm adapters for other users (demineralized water, steam and compressed air).

CAUTION!

It is recommended to connect the sterilizer purge system to the drains, taking into account ventilation requirements. Network backflows can result from non–compliance with these instructions and the sterilization chamber might be contaminated/polluted.
A simple check valve is not considered to be an effective microbiological barrier according to international standards CGMP/CGLP.

To prevent dangers of pollution to the water supply network, it is recommended that suitable back–flow prevention devices and barriers be installed on the intake line of the vacuum pump.
To carry out the connections to the users and the trap, all pipes must be kept at atmospheric pressure.
Make sure that all fittings feature their specific tag.

WARNING!

The deionized water, required with option K10 Steam Generator, must have precise conductivity characteristics.
Conductivity can change according to the type of plant by which it is obtained and the maintenance conditions of the plant. With modern plants you can obtain water with a conductivity lower than 5 µS/m, an optimum value for this application.
Water with a conductivity above 5 µS/m can be used, though, of course, maintenance jobs on the generator will be more frequent. We recommend that you avoid using water having a conductivity above 30 µS/m.
Finally, the following information can be summed up:

Recommended conductivity: 2 to 15µS/m, inspecting the generator every year.
Admitted conductivity: up to 30 µS/m, inspecting the generator every six months.

CAUTION!

The machine is equipped with safety valves calibrated and checked by FEDEGARI AUTOCLAVI at its factory, at an ambient pressure of 1 bar.
If the machine is installed in a place where the ambient pressure is notably different from 1 bar ⟨± 0.1 bar), FEDEGARI recommends you to have the valves re–calibrated by qualified personnel and/or by the engineers selected for installing the machine, according to the new ambient pressure and before starting the work cycle. This trick ensures safety and proper conditions of use.

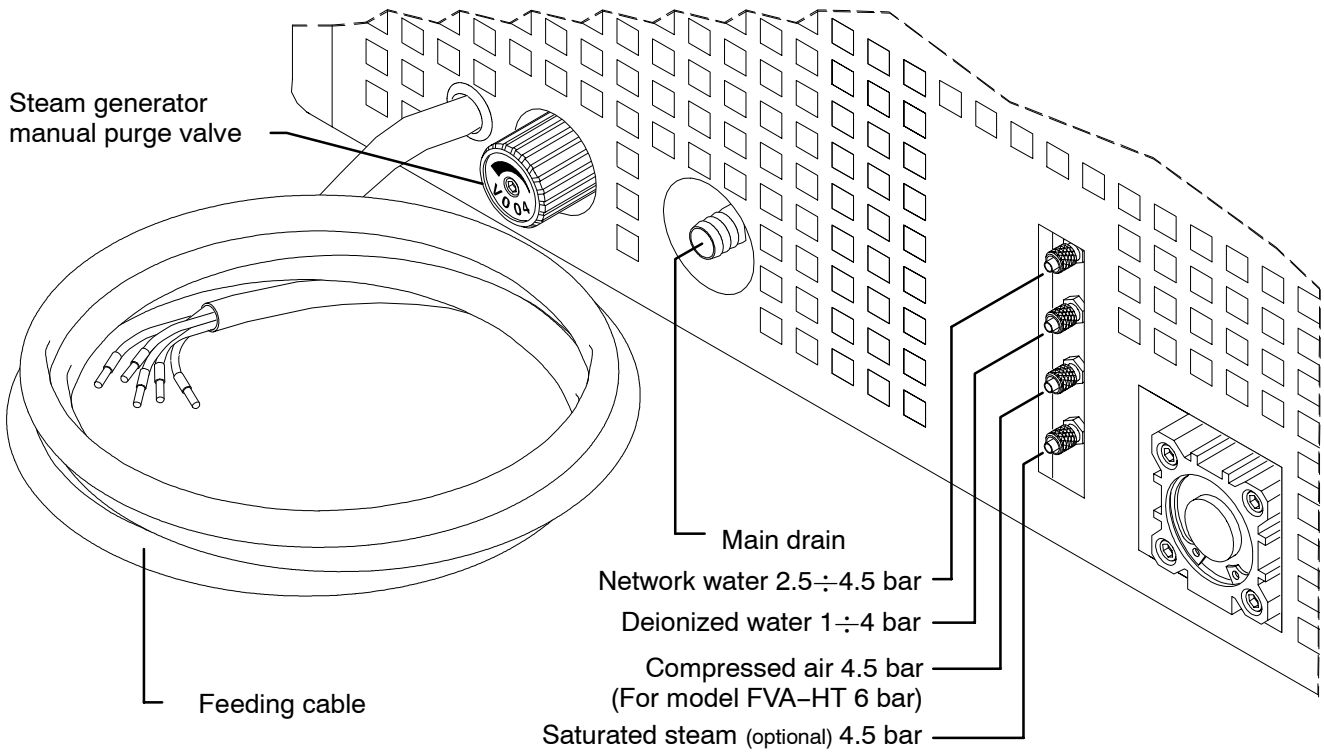


Figure 5.1 – User connections

5.5.1.1. DEIONIZER options (T30)

If the deionizer has been installed (option T30), connect it as follows (cf. Figure 5.2):

1. Connect pipe **A** to the water to be deionized (Ideal pressure: 0.3 bar – 0.8 bar max.; if the water pressure at the inlet is higher, install a pressure reducer with pressure gauge on the network, upstream of the deionizer.
2. Connect pipe **B** to the deionized water load, on the sterilizer.
3. Open the newtork water cock slowly.
4. The resin in the cartridge becomes progressively blue, from top to bottom.
   When the blu resin reaches an height of approx. 15 cm from bottom, this will indicate that the cartridge is empty and must be replaced with a new one.

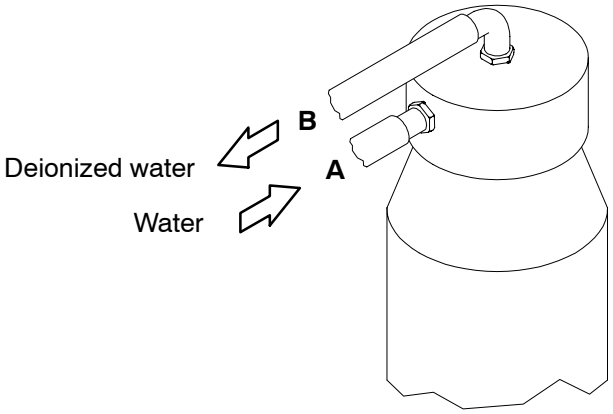


Figure 5.2 – Deionizer connection

WARNING!

The deionizer's reservoir is designed for a max. pressure of 2 bar. Any higher pressure would cause the reservoir collapse, resulting in uncontrolled water spillage.

5.5.2. Wiring

WARNING!

The sterilizer is delivered with a five–pole feeder cable, featuring a suitable section, without plug and cable terminal.

The customer must complete all machine connections to power supply. These connections must take into account the power required by the machine (see section 3.3.2. as well as the user plant conditions), so that their are fully compatible, in compliance with safety rules.

WARNING!

The connection of the sterilizer to the electrical network requires the installation of a protection system on the supply electrical panel. To ensure safety, the installator should use a magnetothermal switch of a suitable size, based on the equipment's electrical absorption (cf. see paragraph 3.3.2.).

WARNING!

The equipment has a single serial output for connection to any external equipment. This output is characterised by a net separation through the double insulation of the power and control circuits.

Make sure that the equipment connected to this output is characterised by an equivalent insulation class.

When carrying out such connections, always take into account the conductor colors inside the cables, according to IEC standards:

- BLACK : phases (R, S,T);
- BLUE : neutral (N);
- YELLOW/GREEN : earth .

Therefore:

1. IF A VACUUM PUMP IS NOT AVAILABLE: the connection has been completed.
2. IF A VACUUM PUMP IS AVAILABLE: slowly turn the pump and check its direction of rotation to make sure that the phase sequence is correct. If the pump is rotating in the wrong direction, invert the two phase conductors, as the only three–phase motor (requiring a correct sequence) has been installed on the vacuum pump.

5.6. INSTALLATION MONITORING

WARNING!

In conformity with the laws current in the Country of destination, pressure equipment must be checked on the responsibility of the User by a competent inspection body.

Before using the machine, carry out a short running–in, consisting of at least two complete no–load cycles. During this period, check the sterilizer for any failures. The machine can start its usual production cycles only on test completion, if no problems have occurred. In case of failures, do not hesitate to contact the manufacturer.

5.7. DISMISSION

To dismiss the machine, follow the procedures listed above, but in reverse.

WARNING!

The eventual demolition of the machine must be carried out according to the laws current in the Country of destination.

6. USING THE STERILIZER

6.1. OPERATION DESCRIPTION

6.1.1. General information

The most important operations dealing with materials to be processed and sterilized, are defined ”sterilization process”, or ”sterilization cycle” or ”cycle”. These operations also concern the presetting/preparation of the sterilizer sub–systems and components, as well as the batch and materials to be processed.

The sterilization process consists of the following main steps:

- Sterilizer preparation;
- Product sterilization;
- Product cooling or drying;
- Final phase.

Each operation also includes other operating processes, the ”phases”, which might change, based on the programs selected by the operator through the menu, their sequence and size, with different physical parameters of processed liquids/fluids.

The machine operation (i.e. the sequence of operations performed on fluids/liquids and on power requirements during the process) is examined below, starting from the most important activities required to process the batch.

The following explanations also describe the physical/functional blocks controlling the above mentioned operations.

The most important activities and the related operations are the following:

- **Sterilizer preparation**

  including:

  * Starting the machine;
  * Loading the product and starting the cycle;

- **Batch sterilization**

  including:

  * Chamber pre–heating;
  * Initial air exhausting;
  * Chamber heating;
  * Sterilization using saturated steam;

- **Cooling or drying**

  including:

  * Spontaneous cooling;

* Convection cooling, with forced air circulation using a fan;
* Drying, using a vacuum pump;

– **Final phase**

including:

* Atmospheric pressure reset;
* Cycle completion;

The machine operation during the above mentioned steps will be also described.

6.2. CONTROLS

6.2.1. General information

The sterilizer is controlled through a system consisting of a dedicated microprocessor card. The microprocessor manages the main drives, monitors and controls the machine hardware and enables the operating sequences (phases) of the specific sterilization ”cycle” programmed.

The microprocessor, hereinafter the ”process controller”, also controls the operator dialogue, through proper peripherals.

The machine is fitted with control elements which, independently of the microprocessor, integrates its tasks for several control functions.

6.2.2. Control desks

The sterilizer features functional control elements and units located partly on the front cabinet paneling and partly on the Operator Panel.

The machine is equipped with the following control devices (see Figure 6.1):

– LCD display (pos. 1);

– Keyboard (pos. 2);

– Main switch (pos. 7);

– Printer (optional K81) or Datalogger (optional K82) (pos .3);

– Emergency push–button (pos. 4);

– Control pressure–vacuum gauge (pos. 5);

– Manual purge valve (not available for model FVA–HT) (pos. 6).

The operator can stand in front of the panel lodging the control elements in order to work without problems and to immediately identify warnings and messages.

LEGEND

1. LCD Display
2. Keyboard
3. Printer or Datalogger
4. Emergency button
5. Pressure-vacuum gauges
6. Manual pressure relief valve of the chamber
7. Main switch
8. Technical cabinet key
9. Effluent duct

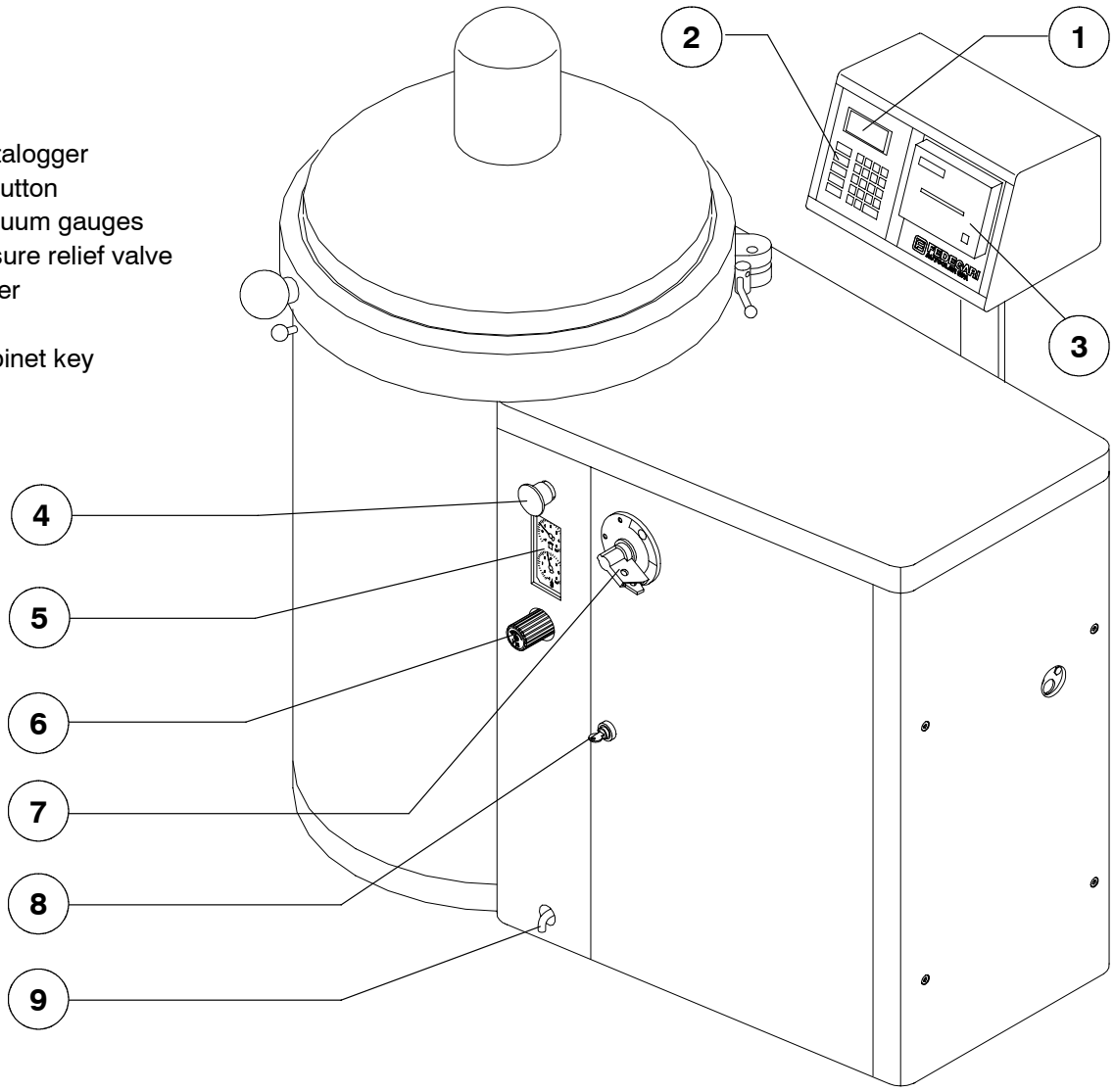


Figure 6.1 – Position of the control elements

6.2.3. Display

It is the most important display device (see Figure 6.2) used by the operator. It is a monochrome, LCD model, consisting of 4 lines x 20 columns.
It displays all menus which can be selected by the operator as well as the most important commands given to the machine. In particular, it displays both pressure and temperature parameters of the sterilization cycle in progress. The parameters related to the sterilization cycle in progress and all warnings are also displayed.

6.2.4. Keyboard

The keyboard (see Figure 6.2) is directly managed by the process controller. It is the most important equipment used by the operator to dialog with the machine and to give it the operating commands required.

It is a diaphragm keyboard, featuring 24 keys and 5 LED indicators. Press the keys to control the process, while interacting with the controller to carry out operations.

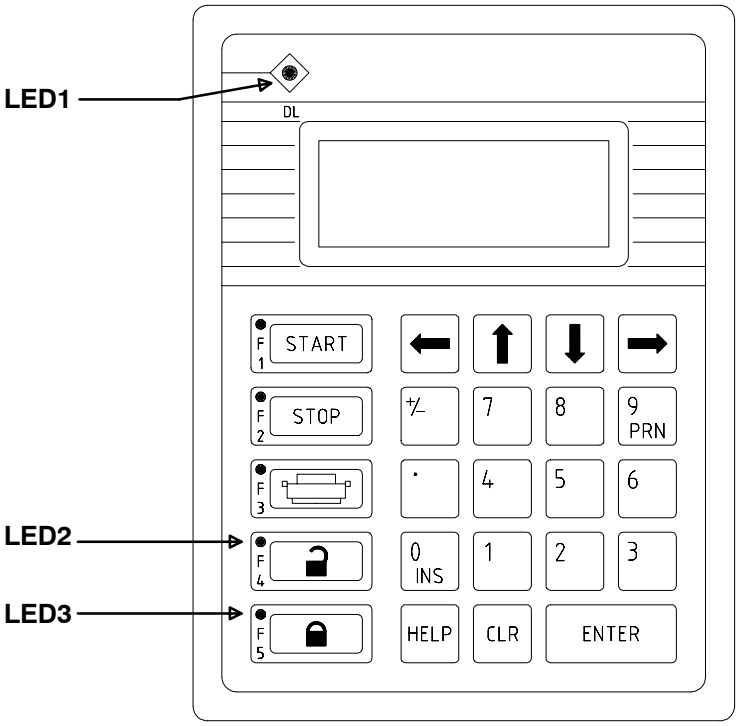
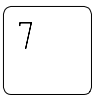
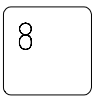
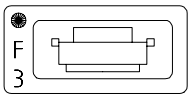
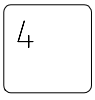
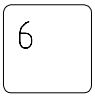
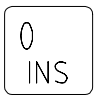
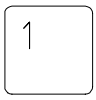
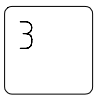
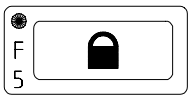


Figure 6.2 — Display/keyboard unit

Table 6.1 – Keyboard: controls

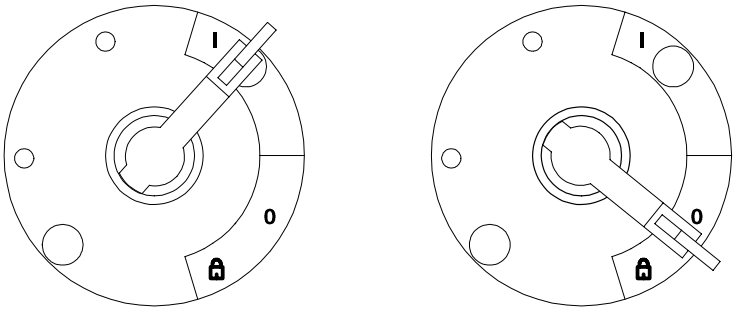
SIMB. / Nr. POS.	DEVICE/FUNCTION
	F1 – Key "Start/Step–by–Step": it is a double function key. 1)It allows to start the program selected during the preparation phase; 2)During the sterilization program execution, press it in order to enter the next operating phase, while blocking the controls related to the operating phase in progress without waiting to reach the preset end–of–phase value.
	Key "Left Arrow": allows to scroll in reverse the pages of the process software menus.
	Key "Up Arrow": It is a double function key. It allows to scroll upwards the selected page, if it has more than 4 lines. Press it after pushing key "INS" to move the cursor on the parameter numeric fields.

SIMB. / Nr. POS.	DEVICE/FUNCTION
	Key "Down Arrow" : it is a double function key. It allows to scroll downwards the selected page, if it has more than 4 lines. Press it after pushing key "INS" to move the cursor on the parameter numeric fields.
	Key "Right Arrow": allows the sequential scrolling of the pages of the process software menus.
	F2 – Stop: this key has three functions. 1) It allows to return to the main menu from the selected program preparation phase. 2) During the program execution, press it to enter the emergency phase immediately. In the Emergency phase, but not in Decontamination Emergency, pressing the "STOP" keys again allows you to terminate the program, entering the "Pressure Balancing" and "Cycle End" phases. 3) During the end–of–cycle phase, press this key to conclude it and to deactivate the acoustic signal.
	Key **7**: allows to enter number "**7**" in the selected field.
	Key **8**: allows to enter number "**8**" in the selected field.
	Key **9**: allows to enter number "**9**" in the selected field and to print through the function identical to key **F3**.
	**F3** –Key "Print image": allows to print the displayed image, when the printer is configured and without processes in progress.
	Key ° : allows to enter the decimal point in the number keyed in.
	Key **4**: allows to enter number "**4**" in the selected field.
	Key **5**: allows to enter number "**5**" in the selected field.
	Key **6**: allows to enter number "**6**" in the selected field.
	F4 – Key "Open cover": press it only when no sterilization processes are in progress. It controls the cover safety devices and compressed air exhaust from the cover seal.

SIMB. / Nr. POS.	DEVICE/FUNCTION
	**0/Ins** it is a double function key: 1) It allows to have access to the insertion mode (INS) and makes the numeric field of the selected parameter blink. 2) In the insertion mode, it allows to enter number 0 in the selected field .
	Key **1**: allows to enter number "**1**" in the selected field.
	Key **2**: allows to enter number "**2**" in the selected field.
	Key **3**: allows to enter number "**3**" in the selected field.
	**F5** – Key "Cover closing": it is activated when no sterilization processes are in progress. Through the microswitch "cover closing" it allows to supply compressed air to the cover seal.
	Key **Help**: it provides useful information on the displayed page. If its message consists of more than 4 lines, keep the **Help** key pressed and use keys "Up Arrow" and "Down Arrow" to display the whole text. To return to the previous page, release the **Help** key.
	Key "**Clear**" : it is a double function key. When displaying and selecting the sterilization process parameters, it allows to return to the previous page. During the execution of the sterilization program, press it to erase temporarily the message displayed in case of alarm.
	Key "**Enter**": it is a double function key, allowing to confirm the value of the modified parameter through the numeric keys. During the sterilization cycle execution, it allows to disable the alarm buzzer.
	LED indicator **1**: If it is OFF, no keys have been pressed. If it is blinking, a communication error has occurred ; if it is ON, a key has been pressed.
	LED indicator **2**: If it is ON, the cover is opened (the seal is not pressurized).
	LED indicator **3**: If it is ON, the cover is closed (pressurized seal).

6.2.5. Main switch

The main switch, located on the rear of the operator panel, allows to enable the process controller. It also allows to enable the related peripherals, which form, together with the controller, the main machine hardware. Switch it to the <O> position to disable the process controller and the peripherals connected to it.



Switch activated

Switch deactivated

Figure 6.3 –Main switch

6.2.6. Printer (optional)

The machine is equipped with a printer (see Figure 6.4), featuring a 200 dpi thermal printing device, RS232 interface. It can support the following transmission protocols:
The printer is directly connected to the process controller and must document in real time the development of the sterilization program in progress.
It is also used to obtain parameter reports and data on the sterilization cycle completed. The operator must feed it with new paper and remove the reports printed on the sterilization process completion.

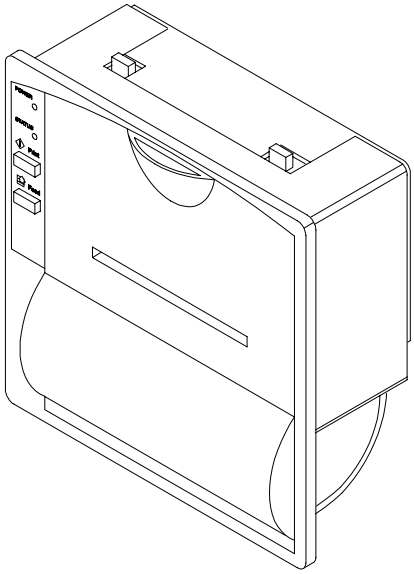


Figure 6.4 – Thermal printer

Table 6.2 – Thermal printing: commands and controls

SYMBOL /POS. No.	DEVICE/FUNCTION
POWER ○	Green Led: if lit, the printed ir supplied.
STATUS ○	Red Led: if continuously lit, indicates the presence of an error (excessive/insufficient head supply or excessive head temperature), if blinking, there is no more paper.
Print ▭	Push–button: not enabled.
Feed ▭	Push–button: is press, the paper is fed.

6.2.7. Datalogger – Kit EN285 (optional K82)

The DATALOGGER (cf. Figure 6.5) is provided with a 200 dpi thermal printing device, RS232 interface.

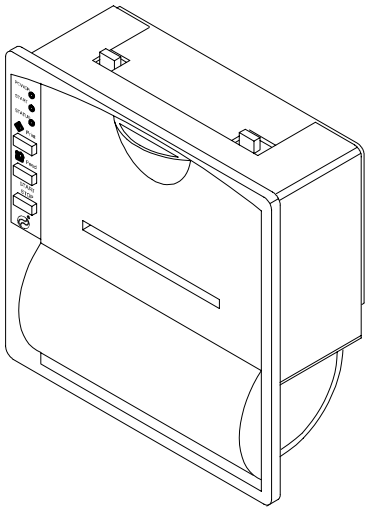


Figure 6.5 – Datalogger

For Printing, it considers the external data, entered through the serial port, and detects temperature and pressure signals with double–detection heat probe Pt100 and a pressure transducer (provided in the Kit).

The Recording can be controlled either manually or automatically:

- **Manually** with key START STOP;
- **Automatically** with an external digital signal corresponding to ”CYCLE IN PROGRESS”.

The two operating modes can be selected in the set–up menu; if automatic operation is selected, the key START STOP is disabled.

The Recording frequency is set, in the set–up, as rate time (”synchronous” recording).
When the recording starts (and, then, according to the rate), the following data is printed (cf. Figure 6.6):

- Recording time/duration (hh:mm:ss);
- Temperature (T––––.–);
- Pressure (P––.––).

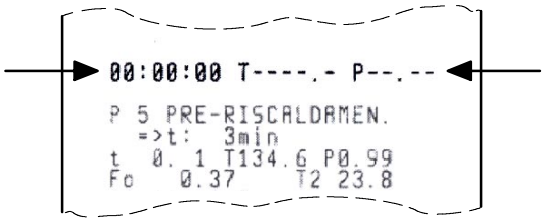


Figure 6.6 – Printing of ”Start recording” data

Among ”synchronous” rates, some ”asynchronous” recordings may occur that, activated through an external signal from the second digital input, are marked by an asterisk.
At the end of the recording (end of cycle), you can print a chart representing the temperature/pressure curves. The curve can include up to 255 samplings. The temperature/pressure range that can be represented is 0 to 150°C and 0 to 5 bar.

Table 6.3 – Datalogger: led functions

SYMBOL /POS. No.	DEVICE/FUNCTION
POWER ○	Green Led: if lit, the Datalogger is supplied.
START ○	Green Led: if blinking, the recording is in progress.
STATUS ○	Red Led: if continuously lit, indicates the presence of an error (excessive/insufficient head supply or excessive head temperature), if blinking, there is no more paper.

Table 6.4 – Datalogger: keys’ functions

KEY	ACTIVATED ON START–UP	ACTIVATED DURING OPERATION
Print	CALIBRATION MENU: sensor calibration.	☞
Feed	Auto–test.	Print date/time (just press the key);Paper feed (press the key and hold it down); ☞
START STOP	Recording start, if enabled in configuration and if sensors are calibrated.If unset sensors are detected, the Datalogger immediately prints the part of the calibration menu relating to the unset sensor.	If enabled in configuration:– Start recording (press the key once);– Stop recording (press the key twice). ☞
Print + Feed	SET–UP Menu	SET CLOCK CALENDAR Menu: date/time setting.

☞ In the CONFIGURATION menus the keys have a dedicated function described in the following table.

Table 6.5 – Datalogger: keys' function in the CONFIGURATION menus

KEY	MENU	FUNCTION
Print	1. AUTOTEST 2. SET–UP 3. CALIBRATION MENU 4. SET CLOCK CALENDAR	1. CONTINUE 2. INCREMENT 3. CALIBRATION 4. INCREMENT
Feed	1. AUTOTEST 2. SET–UP 3. CALIBRATION MENU 4. SET CLOCK CALENDAR	1. EXIT 2. CONFIRM 3. EXIT 4. CONFIRM
START STOP	1. AUTOTEST 2. SET–UP 3. CALIBRATION MENU 4. SET CLOCK CALENDAR	1. – 2. SKIP 3. – 4. EXIT

The TEST and CONFIGURATION menus, in English, are listed in the following table.

Table 6.6 – Datalogger: TEST and CONFIGURATION menus

MENU	FUNCTION
AUTOTEST	Displays: – the make, model and version of the device's firmware; – the configuration parameters; – the set date/time; – the characters of the available fonts. Performs: – the DOT TEST.
SET–UP	Parameters: – PRINT MODE – SERIAL MODE – REAL TIME CLOCK
CALIBRATION MENU	For the initial setting/creation of the high and low points for analog inputs' **R/T** (ohm/°C) and **I/P** (ampere/bar) conversion characteristics. These are set by connecting analog inputs to precision potentiometer in order to obtain the requested resistances and currents.N.B. The recorder activates this manu automatically if the characteristics are lost, e.g. after the back–up battery has run down.After calibration, the analog signals must be calibrated with the **OFFSET** and **GAIN** functions in the **SET–UP** menu.The **OFFSET** can be set by carrying–out the calibration at a low point; the characteristics are thus increased or decreased by entering a positive or negative value, within the range. Then, the **GAIN** can be set by carrying–out the calibration at a high point; if the reading is too low, set a value above 1, if it is too high, set a value below 1, within the range. The **R/T** and **I/P** characteristics can be adjutsed properly.
SET CLOCK CALENDAR	To set the date and time operating through the Datalogger's internal clock.

Table 6.7 – Datalogger: parameters of the SET–UP menu

PARAMETERS	OPTIONS	DESCRIPTION	DEFAULT
FINAL GRAPH	ENABLED DISABLED	Graph at the recording end.	ENABLED
OFFSET TEMP	–9.9°C +9.9°C	Translation of the R/T characteristic	0.0°C
OFFSET PRESS	–0.99 bar +0.99 bar	Translation of the I/P characteristic	0.0 bar
GAIN TEMP	0.667 1.500	Rotation of the R/T characteristic	1.0
GAIN PRESS	0.667 1.500	Rotation of the I/P characteristic	1.0
START/STOP	PRINT KEY EXT. INPUT	Manual recording (activated with the START/STOP key).Automatic recording (digital input).	EXT. INPUT
TIMER	10,20,30,40,50 SEC. 1,2,3,4,5,6,7,8,9,10,15,20,25,30,40,50 MIN. 1 HOUR	Printing rate during recording.	10 sec
LANGUAGE	IT EN DE FR NL	Translation of the final graph heading in: – Italian – English – German – French – Dutch	IT
COLUMNS	24–FONT 16x24 40–FONT 9x24	Normal dimensions (24 columns). Small (40 columns).	24
PRINT	NORMAL REVERSE	Legible after the tear or legible on the printer.	NORMAL
MODE	LITTLE DOUBLE WIDTH DOUBLE HEIGHT EXPANDED	– normal – double width – double height – large characters	LITTLE
FONT	1 2	Type of characters	1
CR–LF	HONOR CR IGNOR CR	In printing mode the return (carriage return) is honored or ignored.	HONOR

PARAMETERS	OPTIONS	DESCRIPTION	DEFAULT
DENSITY	NORMAL DARK VERY DARK VERY LIGHT LIGHT	Black density: – normal – dark – very dark – very light – light	NORMAL
SECONDS	ENABLE DISABLE	Enables the printing of seconds.	ENABLE

Figure 6.7 shows an example of the recording printing in a sterilization cycle.

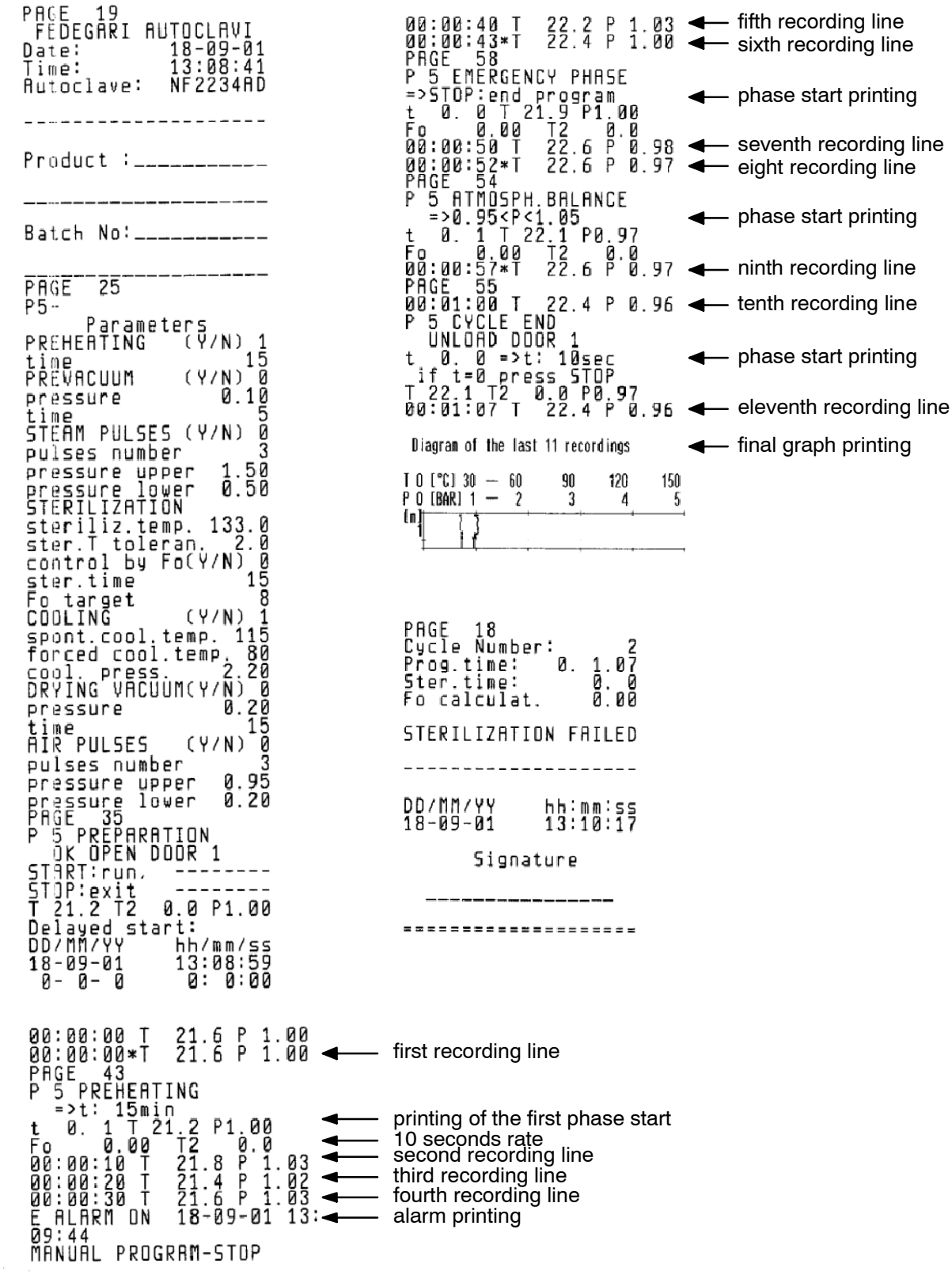


Figure 6.7 – Example of recording printing

6.2.8. Emergency button

Press this button to stop the machine immediately (EMERGENCY STOP) and to switch on the master switch. Once pressed, this button mut be reset manually by pulling it horizonally (see Fig. 6.8).

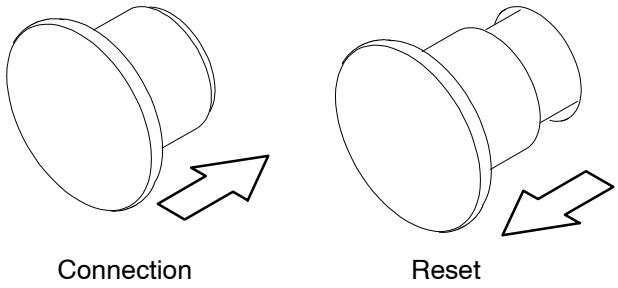
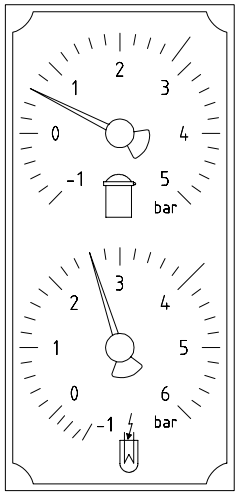


Figure 6.8 – Emergency push–button

6.2.9. Control pressure–vacuum gauges

The machine mechanical analog pressure pressure–vacuum gauges (see Figure 6.9) display pressures in the sterilizer pressurized components.
One of these devices measures the sterilization chamber pressure.
The other one indicates the steam generator pressure, if it has been installed, or the steam supply line pressure.
These gauges feature a scale for reading pressure (bar).
They continue to detect pressure and vacuum even when the sterilizer is deactivated and the chamber is not operating.



Chamber pressure– vacuumgauge

Generator pressure– vacuumgauge

Figure 6.9 – Control pressure–vacuum gauges

6.2.10. Manual pressure relief valve of the chamber (not available on FVA–HT model)

It is a diaphragm valve (Fig. 6.10) located on the front panel of the machine, near the vacuum–pressure gauges, and connected to the sterilizer chamber. If the machine cannot run in automatic mode, the operator can use this valve for manually checking whether any pressure is left in the chamber on the sterilization process completion. This valve is also used to let out the pressure generated in the chamber when the cover must be opened for new loading operations.

CAUTION !

Risk of scalding! Opening the manual valve may cause hot steam to be expelled from the release duct located at the bottom of the front panel of the machine.

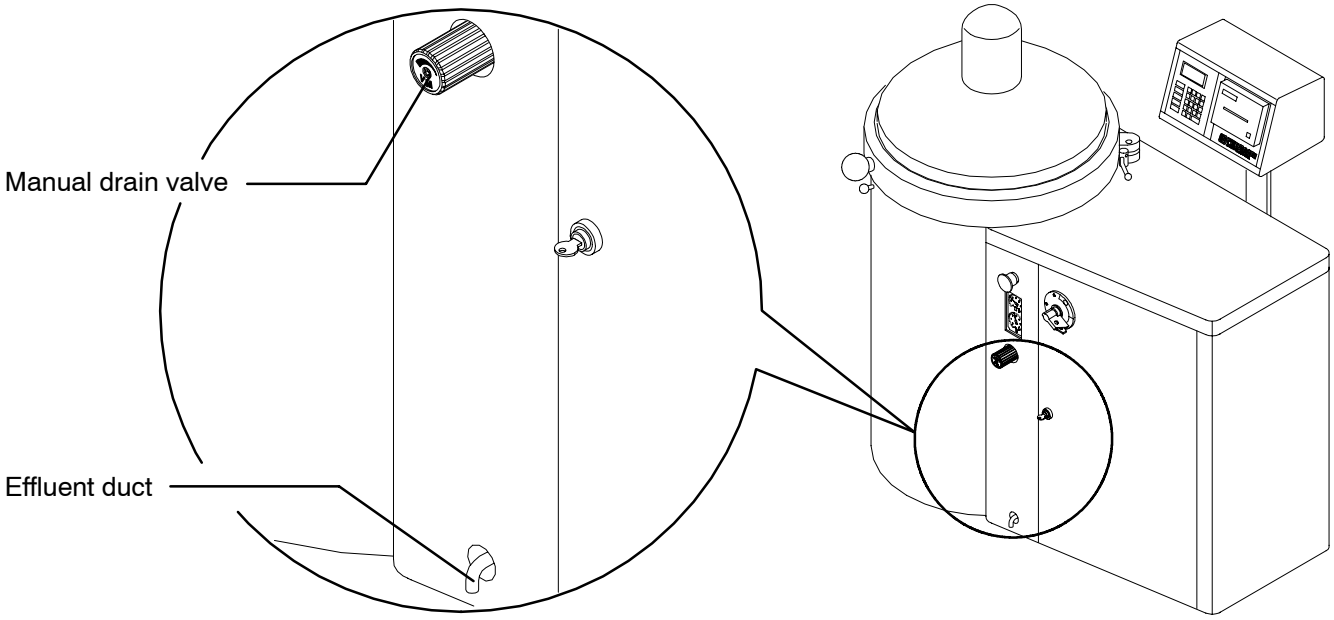


Figure 6.10 – Manual pressure relief valve of the chamber and effluent duct

Table 6.8 – Manual purge valve (see Figure 6.11)

DEVICE/FUNCTION
Knob : Turn it clockwise until it stops, in order to intercept the pipe for purging the sterilization chamber.To purge the chamber, turn the knob anticlockwise from the CLOSE position. To obtain maximum draining section turn the knob anticlockwise until it stops.

a. Valve closing **b.** Valve opening: drainage

Figure 6.11 – Manual purge valve: operations

6.3. ACCESS LEVELS AND OPERATING MODES

6.3.1. Access levels

To protect the system and to guarantee a proper hierarchy, according to all identified tasks, access is allowed only for different authorization levels, by typing in a code, also known as ”password”.
Access is allowed according to 5 levels (0 to 4).
Each level allows to access other levels, by typing in a specific password.
The first 2 (0 and 1) of the 5 access levels (3 and 2), defined ” FEDEGARI DEVELOPER” and ” FEDEGARI PERSONNEL” respectively, are reserved to Fedegari’s engineers, the other levels (2, 3 and 4), defines ”User supervisor”, ”User : user” and ”Stand–by” are reserved to the sterilizer personnel.
Table 1.9 below shows the operating functions associated to every level.

Table 6.9 – Access levels to operating functions

ACCESS LEVELS	OPERATING FUNCTIONS
4 ***STAND–BY*** This password sets the system in a state in which it is impossible to enter data, run programs or modify parameters. Once the SW has been loaded, the system is automatically configured at this level.	– Displaying of the alarms list (EVT) ◆ – Enter password (PSW) ◆ – Control of the Operator Panel’s operation (SYS) ◆ – Exit from the Operator Panel Functions menu (EXT) ◆ – Displaying of program Parameters – Displaying of digital Inputs/Outputs state – Displaying of analog inputs – Displaying of TE1, TE2 and PT calibration data – Displaying of System Parameters – Displaying of sterilizer Data and Options – System Displaying – Displaying of the Alarms List
3 ***USER: USER*** This password allows the access to all system functions for monitoring purposes; it is only possible to select programs.	All ”STAND BY” functions plus: – Program selection and running – Print the Alarms List – Current Alarm Acknowledgement – ”Print Screen” function (keys: ”PRN” or ”F3”)
2 ***USER SUPERVISOR*** This password allows access to all System functions, apart from the SW configuration and loading on the Operator Panel.	All ”USER” functions plus: – Change the system’s date/time (TIM) ◆ – Change Program Parameters – Change the programs’ names (4 to 10) – Force Digital Outputs state – Change TE1, TE2 and PT calibration data – Change System Parameters – Cancel the Alarms List – Select language – Change password – Invert doors – Delayed start of a program

ACCESS LEVELS	OPERATING FUNCTIONS
1 ***FEDEGARI PERSONNEL*** This password allows access to the main System functions, including Configuration.	All "USER SUPERVISOR" functions plus: – System Configuration (PGS) ◆
0 ***FEDEGARI DEVELOPER*** This password allows access to all System functions, including the SW configuration and loading on the Operator Panel.	All "FEDEGARI PERSONNEL" functions plus: – SW loading on the Operator Panel (CFG) ◆

NOTE

The functions with the z symbol are part of the Operator Panel menu. For further information, refer to paragraph 6.4.5.2. Panel functions and operation enabling.

NOTE

The USER SUPERVISOR password allows the modification of the USER SUPERVISOR and USER USER passwords through an appropriate operation in the main menu. The changed passwords will be always reset at their original value, after the SW downloading.

NOTE

The "Step–by–step", "Cycle Stop" and release of the "Contamination Lock" functions can be implemented only at USER SUPERVISOR, FEDEGARI PERSONNEL and FEDEGARI DEVELOPER access levels.

NOTE

For safety reasons, the user must always disable his/her password (entering the STAND–BY password = 0000) when the machine is no longer used and, in any case, before turningit off.

6.3.2. Operating modes

The interface software has three main operating modes.

The first allows to use the machine, while controlling safety from its start until cycle completion (operating mode: "USE").

The second allows to reconfigure the machine application units (sterilization programs) and to define the general parameters controlling all activities and functions common to sterilization processes (operating mode: "CONFIGURATION").

The third sums up all operating modes allowing to service and/or control, also "ON LINE", several software functions, as well as the operating and functional logics (operating mode : "MAINTENANCE").

NOTE

The following information on operating procedures, is addressed to the operator authorized to work in the use mode, as well as to the operator/maintenance engineer who, thanks to his training and knowledge of the machine, corresponds to the professional indicated in section 2.4.3.

6.4. OPERATING PROCEDURES

6.4.1. Warnings

Most labor accidents are due to non–compliance with the most important safety regulations. All operators working with the machine must know and comply with the rules of this manual (also refer to section 2.4. ”Safety warnings”).

6.4.2. General information

The most important activities concerning product processing in order to sterilize it is known as ”sterilization process”, or ”sterilization cycle” or ”cycle”.

To carry out a sterilization process, a specific program must be developed on the process controller, which, through its operating system and the above mentioned program, manages a series of operations related to the components and elements controlling fluid temperature and pressure.

Therefore, thermal energy is properly transferred to the batch, according to its physical characteristics.
Based on its configuration, the sterilizer exploits one or several sterilization programs which can be selected according to the product to be processed.

6.4.3. Sterilization programs

Every program consists of a sequence of elementary modules named phases.
To develop a program the following phase must be sequentially carried out.
They control the sterilizer elements so that the sterilization chamber pressure and temperature are compliant with the set functions.

The programs has a set structure of sequential phases, to be enabled by the operator through proper parameters.
The phase trend can be modified through the related parameters.
A program family can be implemented to meet all requirements, by loading the above mentioned parameters (the ”program parameters”), as well as a series of general parameters concerning activities and functions common to each program.

6.4.3.1. Working parameters

The sterilizer applications (see Figure 6.12, 6.13 and Figure 6.14) consist of a group of specific use programs and of a group, consisting of the same phase sequence, to be used for sterilizing the product.

The above mentioned applications include the following programs:

- Prg.1 – Vacuum test

  It allows to verify the sterilizer vacuum seal. Of course, this program should be used only if the machine is fitted with a *vacuum pump unit* (option K20).

- Prg. 2 – Pressure leak test

  It allows to check the pressure seal . It can be used only when the sterilizer features a *sterilizing filter for air* (K51) and the pressurized chamber *leak test* (option K61).

- Prg. 3 – Decontamination (FVA2/FVA3) High Pathogen (FVA–HT)

  It is fit for sterilizing products coming from environments with microbiologic pollution.

- Prg. 4 – Bowie and Dick Test

  Allows you to check the proper removal of the air from porous batches, as required by European standards for Hospitals EN285. The parameter selection is subject to the machine configuration.

- Prg. 5 ÷10 – Sterilization programs

  The six sterilization programs (5 to 10) have the same structure and can be completely configured by the user. The phase sequence can be modified, by selecting suitable *program parameters*. Their selection is subject to the machine configuration.

To enable the above mentioned programs, enter their identification number in a specific mask (”SELECT PROGRAM” activated from the main menu).

The system enters the initial cycle phase (Preparation), common to all applications.
During this phase, the program does not activate any sterilizer elements or components, thus allowing the operator to complete the sterilizer preparation (product loading in the chamber, cover closing).

To start the sterilization cycle, press key

.

NOTE

All programs are supplied with the default value of every parameter, which will be acquired by the system unless the operator changes it.

Before going on, the program checks the cover system logic, in order to assure that the operations carried out are compliant with the chamber safety conditions.

When running, the program can be stopped before the sterilization process completion only through a manual emergency control (cycle stop), by an activated alarm (due to a failure occurring during the sterilization process) or when the machine is restarted after a black–out. In this case, the sterilizer enters an ”emergency” phase, providing a wait state which protects the machine, the personnel and any loaded products. The sterilizer is no longer in the emergency state and immediately reaches the cycle final phases (pressure balancing and end–of–phase), by pressing key F2 STOP.

The operator will be permitted to execute specific programs (1, 2, 3) and to select some phase sequences of the sterilization programs only if the sterilizer features one or several of the following additional systems (Table 6.10.):

Table 6.10 – Additional component program phase

PROGRAMS/PHASES	DESCRIPTION	Phase No.	K20	K51	K52	K61	K62
Prg. N.1	VACUUM TEST	–	X				
Prg. N.2	PRESSURE TEST	–				X	X
Prg. N.3	DECONTAMINATION (FVA2/3)	–					X
	HIGH PATHOGEN (FVA–HT)						
Phase	INITIAL VACUUM	3+4	X				
Phase	STEAM PULSES	5	X				
Phase	FINAL VACUUM	10 + 11	X				
Phase	COOLING FORCED	9			X		
Phase	AIR PULSES	12	X				

NOTE

Option K62 includes option K61.

NOTE

The operator must set up sterilization programs compatible with the machine components, fit for the product to be sterilized. The sterilizer software will prevent the operator from select phases, programs or functions which are not allowed by the machine P&ID configuration.

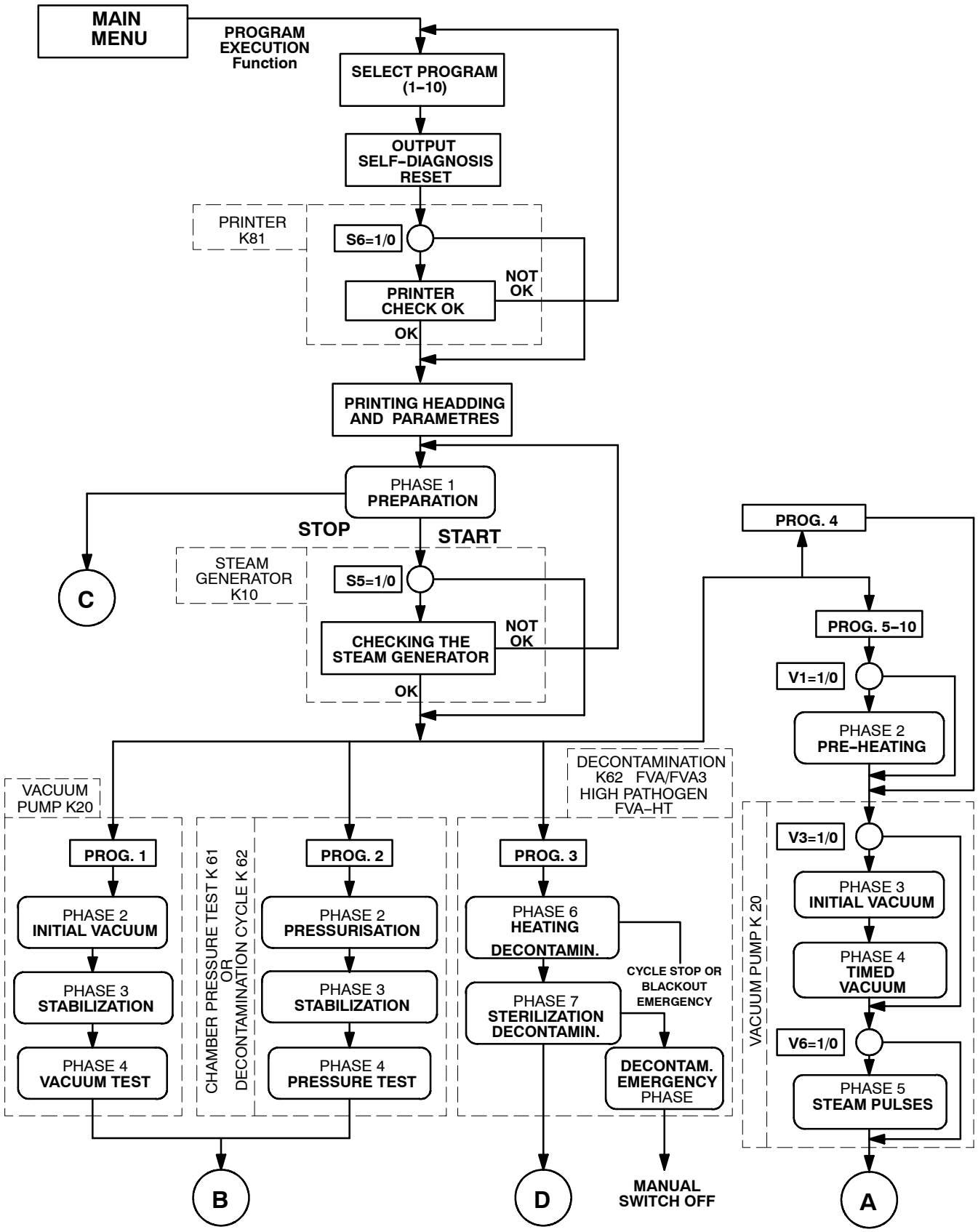


Figure 6.12–Flow chart of the sterilizer cycles (1st part)

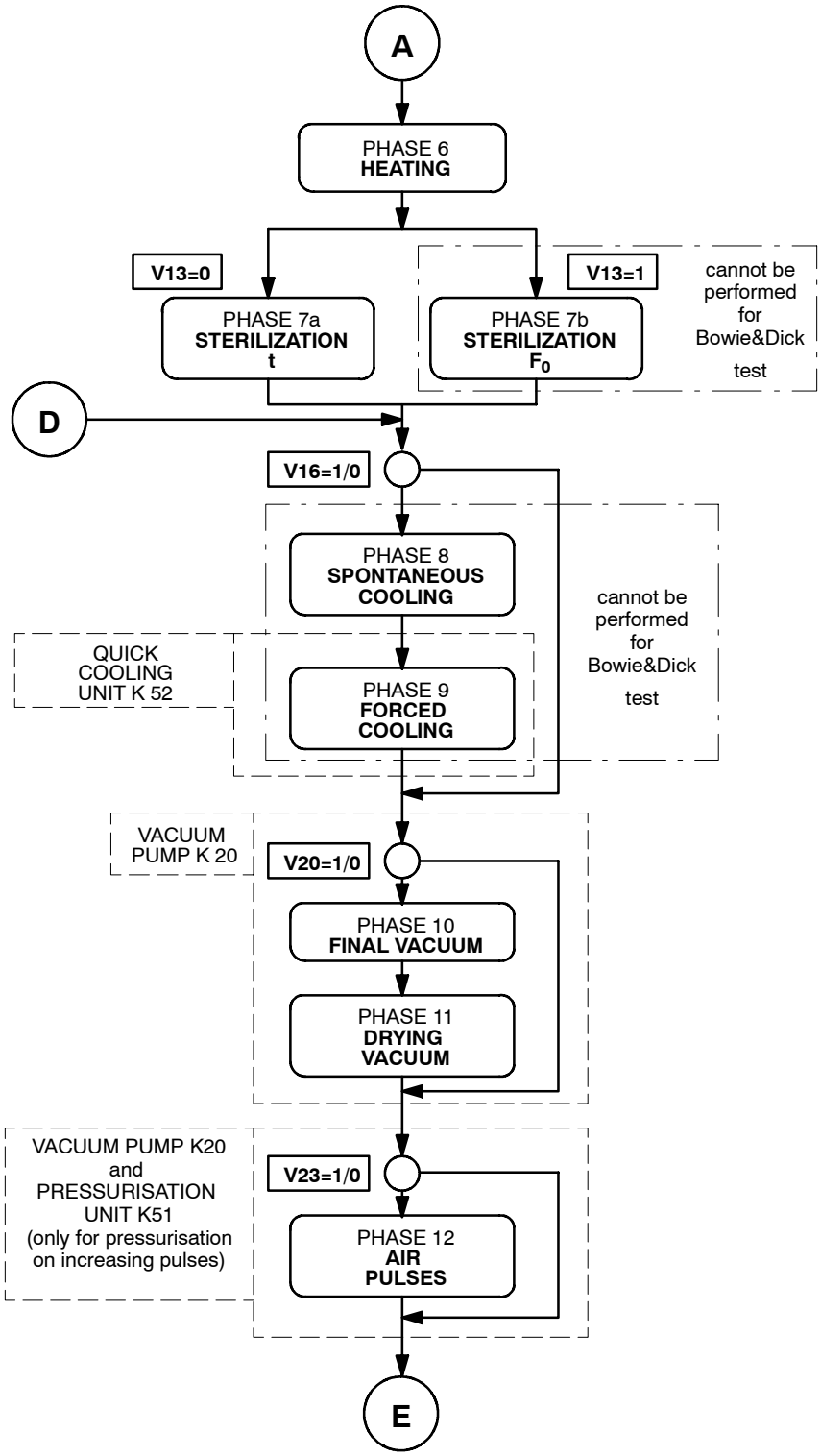


Figure 6.13 – Flow chart of the sterilizer cycles (2nd part)

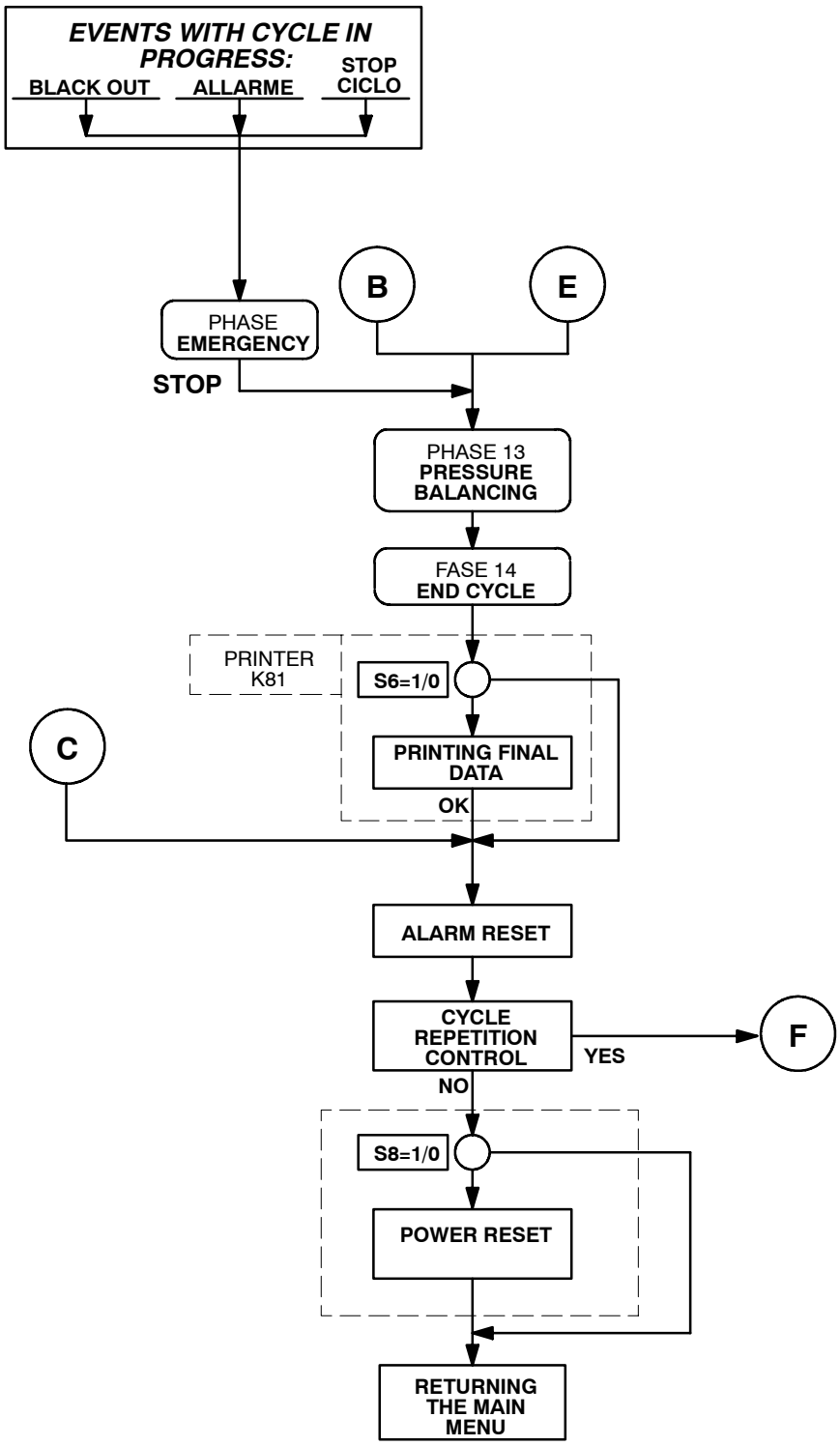


Figure 6.14 – Flow chart of the sterilizer cycles (3st part)

6.4.3.2. Program parameters

The operator can select the desired phase sequence (v1, v2, ...v22) or modify some phase parameters in order to choose the operating configuration required by simply setting proper ”program parameters”.

Program parameters are available in display and adjust mode, when accessing suitable software pages from the main menu (see 6.5.2.).

These 10 pages, one for each program, consist of two types of parameters:

- Phase selection parameters, allowing to enable the corresponding phase(s);
- Phase parameters allowing to set target times and values for the phase.

The four tables below describe the program parameters of the sterilizer applications.

In particular, program parameters (5÷10) mentioned in Table 6.16 are supplied with their default values for special uses:

- Prg. 5 – Solid materials
- Prg. 6 – Porous materials
- Prg. 7 – Rubber materials
- Prg. 8 – Closed box for sterilization
- Prg. 9 – Liquid forced cooling
- Prog.10 – Spontaneous–cooling liquids

The meaning of the table fields is the following:

- **NO:** parameter identification number;
- **DESCRIPTION**: parameter name;
- **FUNCTION:** description of the activities managed by the parameter;
- **MIN**: minimum parameter value;
- **DEF**: parameter Default value for every program;
- **MAX**: maximum parameter value;

Units of measurement of the parameter: bar (bar), centigrades (°C), minutes (min).

Table 6.11 – Program parameter list: ***VACUUM TEST***

No.	DESCRIPTION		FUNCTION	MIN	DEF	MAX
V1	TEST PRESSURE	bar	Target pressure during the initial vacuum phase.	0.01	0.20	1.00
V2	STABILIZ. TIME	min	Duration of the pressure stabilization phase in the chamber.	0	2	480
V3	VACUUM TEST TIME	min	Target time of vacuum test in the chamber.	0	10	480
V4	MAX. PRESS. RISE	bar	Max. pressure rise allowed during the vacuum test in the chamber. When the chamber pressure exceeds the initial pressure of the phase plus V4, the ”LEAK TEST ALARM” is displayed and the test fails.	0.001	0.013	1.000

Table 6.12 – Program parameter list: ***PRESSURE TEST***

No.	DESCRIPTION		FUNCTION	MIN	DEF	MAX
V1	TEST PRESSURE	bar	Target pressure of the pressurization phase	1.00	2.00	3.00
			Values for FVA–HT model	1.00	5.00	5.00
V2	STABILIZ. TIME	min	Duration of pressure stabilization phase in the chamber.	0	2	480
V3	VACUUM TEST TIME	min	Target time of the pressure test in the chamber.	0	10	480
V4	MAXIMUM PRESSURE LACK	bar	Max. pressure rise or drop allowed during the chamber leak test. When the chamber pressure exceeds the inintial pressure of the phase plus V4 or is lower than the initial pressure of the phase less V4, the ”LEAK TEST ALARM” is displayed and the test fails.	0.001	0.013	1.000

Table 6.13 – Program parameter list: HIGH PATHOGEN – SPECIFIC FOR THE FVA–HT MODEL

No.	DESCRIPTION		FUNCTION	MIN	DEF	MAX
V10	STER. T. TEMP.	°C	It is the temperature that, being added to 0.2°C represents the heating phase final target. It is also the minimum temperature allowed during the sterilization phase. When the chamber temperature drops below this value, the alarm ”STER. TEMP. LACK.” is displayed and the sterilization time is no longer counted.	105.0	140.0	140.0
V14	STER. TIME	min	Duration of the sterilization phase.	0	10	3000

No.	DESCRIPTION		FUNCTION	MIN	DEF	MAX
V16	COOLING	0/1	It allows to enable/disable the spontaneous or forced cooling phase.	0	0	1
V17	SPONT. COOL. TEMP.	°C	Spontaneous cooling phase target temperature.	50	110	140
V18	FORCED COOL TEMP.	°C	Forced cooling phase target temperature.	50	80	140
V19	COOL. PRESS.	bar	Forced cooling phase target pressure.	1.00	3.60	3.60
V20	DRYING VACUUM	0/1	It allows to enable/disable the product drying phases (final vacuum and drying vacuum).	0	0	1
V21	PRESSURE	bar	Drying vacuum phase target pressure.	0.01	0.20	1.00
V22	TIME	min	Drying vacuum duration.	0	10	480
V23	AIR PULSES	0/1	It allows to enable/disable the air pulse phase inside the chamber.	0	0	1
V24	PULSES NUMBER	n	Number of air pulses during the phase.	0	3	9
V25	PRESSURE UPPER	bar	Increasing pressure of air pulses.	0.10	0.95	3.00
V26	PRESSURE LOWER	bar	Decreasing pressure of air pulses.	0.08	0.20	3.00

Table 6.14 – Program parameter list: DECONTAMINATION

No.	DESCRIPTION		FUNCTION	MIN	DEF	MAX
V10	STER. T. TEMP.	°C	It is the temperature that, being added to 0.2°C represents the heating phase final target. It is also the minimum temperature allowed during the sterilization phase. When the chamber temperature drops below this value, the alarm "STER. TEMP. LACK." is displayed and the sterilization time is no longer counted.	105.0	121.0	122.0
V14	STER. TIME	min	Duration of the sterilization phase.	0	10	3000
V16	COOLING	0/1	It allows to enable/disable the spontaneous or forced cooling phase.	0	0	1
V17	SPONT. COOL. TEMP.	°C	Spontaneous cooling phase target temperature.	50	110	140
V18	FORCED COOL TEMP.	°C	Forced cooling phase target temperature.	50	80	140
V19	COOL. PRESS.	bar	Forced cooling phase target pressure.	1.00	3.60	3.60
V20	DRYING VACUUM	0/1	It allows to enable/disable the product drying phases (final vacuum and drying vacuum).	0	0	1
V21	PRESSURE	bar	Drying vacuum phase target pressure.	0.01	0.20	1.00
V22	TIME	min	Drying vacuum duration.	0	10	480

No.	DESCRIPTION		FUNCTION	MIN	DEF	MAX
V23	AIR PULSES	0/1	It allows to enable/disable the air pulse phase inside the chamber.	0	0	1
V24	PULSES NUMBER	n.	Number of air pulses during the phase.	0	3	9
V25	PRESSURE UPPER	bar	Increasing pressure of air pulses.	0.10	0.95	3.00
V26	PRESSURE LOWER	bar	Decreasing pressure of air pulses.	0.08	0.20	3.00

Table 6.15 – List of ***Bowie & Dick*** *program parameters*

No	DESCRIPTION		FUNCTION	MIN	DEF	MAX
V3	INITIAL VACUUM	0/1	Allows the enabling/disabling of the initial vacuum condition.	0	0	1
V4	PRESSURE	bar	End–of–phase target pressure value for letting air out of the chamber.	0.01	0.20	1.00
V5	TIME	min	Indicates the duration of the vacuum phase inside the chamber, with steam injection and air extraction.	0	3	480
V6	STEAM PULSES	0/1	Allows the enabling/disabling of the steam pulse phase.	0	0	1
V7	PULSES NUMBER	n.	Indicates the number of steam vacuum pulses.	0	3	9
V8	PRESSURE UPPER	bar	Indicates the increasing pulse pressure value.	0.10	1.50	3.00
V9	PRESSURE LOWER	bar	Indicates the decreasing pulse vacuum value.	0.10	0.50	3.00
	STERILIZATION					
V10	STER. T. TEMP.	°C	It is the temperature that, being added to 0.2°C represents the heating phase final target. It is also the minimum temperature allowed during the sterilization phase. When the chamber temperature drops below this value, the alarm "STER. TEMP. LACK." is displayed and the sterilization time is no longer counted.	65.0	133.0	136.0
V11	STER. T. TOLER.	°C	It is the temperature value based on which the sterilization phase is regulated. The sterilization tolerance determines the sterilization range by adding to sterilization temperature V10 its value. *	1.0	2.0	5.0
V14	STERILIZ. TIME	min	Duration of the sterilization phase.	0.0	3.5	900.0
V20	DRYING VACUUM	0/1	Allows the enabling/disabling of the product drying phases.	0	0	1
V21	PRESSURE	bar	Pressure target during the 1st vacuum phase for drying.	0.01	0.20	1.00
V22	TIME	min	Duration of the drying phase.	0	10	480

No	DESCRIPTION		FUNCTION	MIN	DEF	MAX
V23	AIR PULSES	0/1	Allows the enabling/disabling of the air pulse phase inside the chamber.	0	0	1
V24	PULSES NUMBER	n.	Number of air pulses.	0	3	9
V25	UPPER PRESSURE	bar	Increasing pressure of air pulses.	0.10	0.95	3.00
V26	LOWER PRESSURE	bar	Decreasing pressure of air pulses.	0.08	0.20	3.00

Table 6.16 – Program parameter list ***(PROGRAMS 5 ÷ 10)***

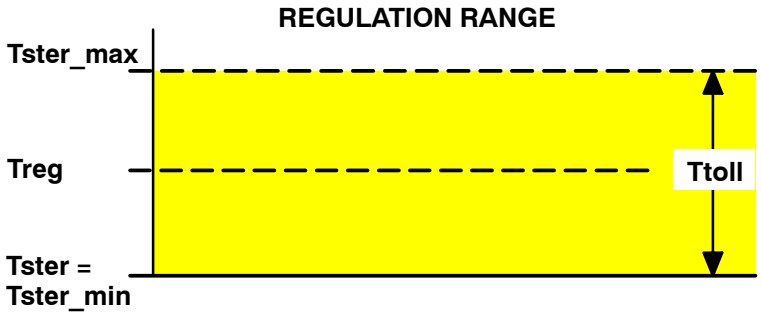
No.	DESCRIPTION		FUNCTION	Prg 5	Prg 6	Prg 7	Prg 8	Prg 9	Prg 10	MIN	MAX
V1	PREHEATING	0/1	Allows the enabling/disabling of the pre–heating phase.	0	0	0	1	1	1	0	1
V2	TIME	min	Pre–heating phase duration	3	3	3	15	15	15	0	480
V3	PREVACUUM	0/1	Allows the enabling/disabling of the initial vacuum phase.	1	1	1	1	0	0	0	1
V4	PRESSURE	bar	It is the end–of–phase target pressure of air extraction from the chamber.	0.10	0.10	0.10	0.10	0.20	0.20	0.01	1.00
V5	TIME	min	Duration of the vacuum phase inside the chamber, with steam injection and air extraction.	5	3	5	0	3	3	0	480
V6	STEAM PULSES	0/1	Allows the enabling/disabling of the steam pulse phase.	0	1	1	1	0	0	0	1
V7	PULSES NUMBER	n.	Indicates the steam pulses number.	3	3	3	3	3	3	0	9
V8	PRESSURE UPPER	bar	Upper pressure of steam pulses.	1.50	1.20	1.20	1.20	1.50	1.50	0.10	3.00
V9	PRESSURE LOWER	bar	Lower pressure of steam pulses.	0.50	0.10	0.20	0.10	0.50	0.50	0.10	3.00
	STERILIZATION										
V10	STER. T. TEMPER.	°C	It is the temperature which (added to 0.2°C indicates the pre–heating phase final target. It is also the minimum temperature allowed during the sterilization phase. When the chamber temperature drops below this value, the alarm ”STER. TEMP. LACK.” is displayed and the sterilization phase time is suspended.	133	133	120	133	120	120	65	136

No.	DESCRIPTION		FUNCTION	Prg 5	Prg 6	Prg 7	Prg 8	Prg 9	Prg 10	MIN	MAX
V11	STER. T. TOLER.	°C	It is the temperature value based on which the sterilization phase is regulated. The sterilization tolerance determines the sterilization range by adding to sterilization temperature V10 its value. *	2.0	2.0	2.0	2.0	2.0	2.0	1.0	5.0
V13	CONTROL BY F0	°C	Allows the selection of the type of regulation used during the sterilization phase: – "0" --- time – "1" --- control with F0 Control is carried out during the heating phase	0	0	0	0	0	0	0	1
V14	STER. TIME	min	Sterilization phase duration.	10	10	20	10	15	15	0	3000
V15	F0 TARGET	min	Duration of the heating/sterilization phase in F0.	8	8	8	8	8	8	0	9999
V16	COOLING	0/1	Allows the enabling/disabling of the cooling phase.	0	0	0	0	1	1	0	1
V17	SPONT. COOL. TEMP.	°C	Spontaneous cooling phase target temperature.	115	110	110	110	120	80	50	140
V18	FORCED COOL. TEMP.	°C	Forced cooling phase target temperature.	80	80	80	80	80	80	50	140
V19	COOL. PRESS.	bar	Chamber pressure used during the forced cooling phase.	2.20	2.20	2.20	2.20	2.20	2.20	1.00	3.40
V20	DRYING VACUUM	0/1	Allows the enabling/disabling of the product drying phases.	1	1	1	0	0	0	0	1
V21	PRESSURE	bar	Target pressure during the 1st drying vacuum phase.	0.20	0.10	0.10	0.20	0.20	0.20	0.01	1.00
V22	TIME	min	Drying phase duration.	15	20	20	10	10	10	0	480
V23	AIR PULSES	0/1	Allows the enabling/disabling of the air pulse phase in the chamber	0	1	1	1	0	0	0	1
V24	PULSES NUMBER	n.	Air pulses number.	3	3	3	3	3	3	0	9
V25	PRESSURE UPPER	bar	Upper pressure of air pulses.	0.95	0.90	0.90	0.90	0.95	0.95	0.10	3.00
V26	PRESSURE LOWER.	bar	Lower pressure of air pulses.	0.20	0.20	0.10	0.10	0.20	0.20	0.08	3.00

* The **sterilization range** (ranging between **Tster_min** and **Tster_max**) and the **Treg Regulation temperature** are defined using only two parameters:

No.	DESCRIPTION		MIN	DEF	MAX
V10	STER. T. TEMP. (Tster)	(°C)	65.0	120.0 / 133.0	136.0
V11	STER. T. TOLER. (Ttoll)	(°C)	1.0	2.0	5.0

REGULATION TEMPERATURE (Treg)	(°C)	65.5	121.0 / 134.0	137.5



where:
- **Tster_min = Tster**
- **Tster_max = Tster + Ttoll**
- **Treg = Tster + Ttoll / 2**

6.4.3.3. General system parameters

During the execution of the sterilization program, the machine is managed by specific parameters, as well as by a series of general parameters (SYSTEM PARAMETERS) controlling the activities and functions common to every sterilization process.
Table 1.10 below shows the general parameter list and includes a short description of their functions.
The meaning of the table fields is the following:

- **NO**: parameter identification number
- **DESCRIPTION**: parameter name
- **FUNCTION**: description of the activities managed by the parameter
- **MIN**: minimum parameter value
- **DEF**: parameter Default value

– **MAX**: maximum parameter value

Table 6.17 – General system parameters

No.	DESCRIPTION		FUNCTION	MIN	DEF	MAX
1a	STERIL. –P TOLER.	bar	During the product heating and sterilization, the chamber pressure is regulated according to the value of these 2 parameters and of the program parameter ”STER. TEMP.”, allowing to obtain the regulation pressure.	0.02	0.03	0.10
1b	STERIL. +P TOLER.			0.00	0.00	0.10
2	MIN. P. BALANCE Pmaxb	bar	It is the minimum pressure inside the chamber during pressure balancing and end–of–cycle phases, to enable the cover opening.	0.50	0.95	1.00
3	MAX. P. BALANCE Pmaxb	bar	It is the maximum pressure inside the chamber during pressure balancing and end–of–cycle phases, to enable the cover opening.	0.55	1.05	1.10
4	CYCLE END TIME	sec	It indicates the cycle end phase duration, in seconds.	0	10	999
5	STEAM GENER.	0/1	It can take only values 0 and 1. Number 1 must be set when the machine features an autonomous steam generator.	0	0	1
6	PRINTER	0/1	It enables printing of the cycle data during the sterilization program execution. Value 1 is set only if the machine is equipped with a printer.	0	0	1
7a	PRINTER INTERVAL	sec	It allows to set the printing interval for the cycle data during the execution of the sterilization program. Operating only if the machine is provided with a printer and the ”PRINTER” general parameter is set to 1.	30	60	9999
7b	PRINTING INTERVAL IN STERILIZATION	sec	It allows to set the printing interval for the cycle data during the execution of the sterilization program. Operating only if the machine is provided with a printer and the ”PRINTER” general parameter is set to 1.	30	999	9999
8	POWER RESET	0/1	On the cycle end phase completion, the machine can be automatically switch off only if this parameter is set to 1.	0	0	1
9	CHECK FINAL T	0/1	Value to be set to 1 in order to enable the control of system parameter ”FINAL TEMPERAT.” on heat probe T001.	0	0	1
10	FINAL TEMPERAT.	°C	It is the temperature (measured by heat probe T001) above which the cover does not open. This control is operating only if the parameter ”CHECK FINAL T” is set to 1.	0	70	95
11	DOOR INVERSION.	°C	Not applicable	0	0	1
12	REPEAT CYCLE.	°C	If this option is enabled, the cycle can be repeated up to 20 times.	0	0	20

6.4.4. Operating phases

The operator manages the sterilization process according to the following main operating phases:

- Switching on and initial controls;
- Operation enabling;
- Product loading;
- Program starting;
- Process control;
- Product unloading;
- Disabling or switching off.

To process the product, these operating phases must be carried out in sequence. Of course, to execute these operating phases, the operator must be acquainted with a series of auxiliary functions, such a:

- Logic of access to the menu pages;
- Cover opening logic;
- Printing functions;
- Step–by–step and cycle stop functions;
- F_0.

6.4.4.1. Menu page access logic

The main menu is automatically displayed when the controller has been fed.

Other pages can be accessed:

- by entering the number corresponding to the option selected through the main menu or another menu ;
- by pressing key ,

To return to the previous menu:

- Press key ;
- Press key .

6.4.4.2. ”Step–by–step” and ”Cycle stop” functions

During the sterilization program execution, until the process is over, the operating interaction is inhibited, except for monitoring the chamber parameters.

In case of failures, the operator is allowed to intervene in the process in progress through the specific functions (STEP–BY–STEP and CYCLE STOP) described below.

STEP–BY–STEP Function

To enable it, at the 3 highest password levels, .

It allows to have access to the next operating phase, by blocking the controls related to the operating phase in progress, without waiting to reach the end–of–phase set value. The alarm "PHASE STEP UTILIZED" is displayed and printed.

CYCLE STOP function

To enable it, at the 3 highest password levels, press key F2 STOP .

It allows to enter the emergency phase. The alarm "MANUAL PROGRAM–STOP" is displayed and printed. When pressing key F2 STOP , the system has access to the Pressure Balancing and Cycle End functions.

CAUTION !

Pressing this key is likely to damage F2 STOP the batch in all cases in which, during sterilization of liquids kept in tight containers, a pressure differential dangerous for containers is caused when reaching atmospheric pressure.
The pressure differential makes liquids boil even though they are kept in containers which are not tight, but feature protective filters.
Press key F2 STOP only after having checked that the chamber pressure has spontaneously reached atmospheric pressure, and when the product temperature is < 70°C.

STEP–BY–STEP and CYCLE STOP functions will be enabled in all phases except for the cases mentioned in the following Table

Table 6.18 – Step–by–Step and Cycle Stop enabling

PHASE	PRG.	STEP–BY–STEP	CYCLE STOP
Preparation	all	no	no
Pressure balancing	all	yes (*)	no
Cycle end	all	no	no
Phase emergency	all	no	no
Black Out emergency	all	no	no
Decontamination program emergency	3	no	no
Decontamination program heating	3	yes	yes
Decontamination program sterilization	3	no	yes
Spontaneous cooling	3–10	no	yes
Forced cooling	3–10	no	yes

(*) When forced exit is required, having pressed F2 STOP during the EMERGENCY phase, if no pressure balance is reached.

6.4.4.3. F_0

This parameter is the sterilization time at 121,11° C or, better, the time related to a sterilization process carried out at another temperature and duly calculated for a 121,11°C process, so that it has an equivalent lethal thermal power, i.e.

it proves effective in killing microbes (probability of finding 1 non sterile unit out of a certain number of PNSU units).
The calculated F0 is totalled by processing the temperature values measured by the heat probe if the measured temperature is ranging from 100°C to 143, 9°C.
F0 value is updated every second, displayed and printed when the cycle is over in order to check the lethal doses applied in the point monitored by **T001**.
F0, value is also used to regulate the sterilization phase through proper program parameters.

6.4.4.4. Opening/closing logic of the cover

Opening system

To open the sterilizer:

- No process cycle must be in progress;
- Both the pressure transducer connected to the sterilizer control system and the electromechanical safety pressure switch must indicate that pressure inside the chamber is equal to atmospheric pressure again;
- The heat probe located inside the chamber measures a temperature lower than the safety set value (this is possible only if the system parameter ”CHECK FINAL T” has been set);

  If the above mentioned conditions have been met, the operator can enable compressed air exhausting from the seal housing. The ”Opened cover” LED on the operator panel will indicate that the cover can be turned to unload the batch.

Closing system

Manually turn the cover in order to close it, while pressing the safety lever which releases it.
When the cover has reached the closing position, its hooking lever is released. The cover cannot turn and the safety limit switch is pressed.
The limit switch allows the system to send the control required to the solenoid valves allowing to supply compressed air to the seal housing of the sealing system.
The cover being properly positioned, a control sent by the operator enables the compressed air supply to the seal housing, in order to close the chamber and to lock the cover.

When the chamber is closed, the LED located near the

key switches on.

If the cover is not perfectly closed and the cycle is in progress, a specific alarm message (OPEN DOOR IN CYCLE) is displayed causing the cycle to be stopped.

6.4.4.5. Printing function (if a printer is available)

The machine is equipped with a printer to print cycle data.

The preset printing enabling and intervals are shown in the general parameter page.
The printing report includes the following information:

1. HEADING
   - FEDEGARI AUTOCLAVI
   - Program start–up DATE AND TIME
   - STERILIZER NF (serial number entered by FEDEGARI's engineers through a reserved menu)
   - Message about the number of repetitions set
   - Notes on the sterilized product
   - Notes on the batch program

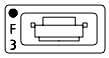
2. PROGRAM NUMBER AND PROGRAM PARAMETER LIST

3. CYCLE DATA

   Displayed data are printed according to set intervals, calculated based on the phase time.

4. ALARM MESSAGES:
   - ALARM NAME
   - detected ALARM STATE (ON, OFF, ACK)
   - ACK (acknowledgment request), if activated by the alarm
   - Data recording DATE and TIME

5. FINAL DATA
   - CYCLE NUMBER (progressive program time)
   - PROGRAM TIME (overall program time)
   - STERILIZATION TIME (time of exposure to correct temperatures during the sterilization phase)
   - Fo CALCULATED (Final F_0 value)
   - Message about the test or sterilization result
   - Message about the number of repetitions set
   - DATE AND TIME (Program end time)
   - SIGNATURE (Space for the operator's signature)

When no cycles are in progress, the page displayed can be printed through the 

command.

6.4.5. Operating procedures and warnings

CAUTION!

The operator must work so that all controls are easy to reach and suitably positioned from an ergonomic viewpoint. Keep the working place free from any equipment, other than the tools required to control the sterilizer. Before starting the machine, do not allow unauthorized people to stay near the sterilizer.

Procedures

The main operating phases mentioned in the previous section thoroughly identify the sequence of procedures carried out by the operator in order to use, step–by–step, the sterilizer according to its functions.
Every operating phase consists of several sections, based on the above mentioned sequence.

NOTE

Should the graphic representation of the menus and pages supporting these instructions include more than 4 lines, the remaining text will be in a shadow area.

To display the whole text, use keys ↑ and ↓.

NOTE

Some pages displayed to support the manual instructions show information, values and parameters by way of example. They could not be installed on your sterilizer.

Instructions for use

This section provides useful information and warnings for operating procedures. However, these procedures will also include specific warnings, whenever it is required by the type of procedure to be carried–out.

WARNING!

The emergency stop mushroom–head button must not be used improperly. Use it carefully, without forcing it, to avoid damaging it.

NOTE

All characters inconsistent with selectable options cannot be entered, as they are not accepted by the controller.

6.4.5.1. Switching on and initial checks

Lighting the workplace

Check that the workplace is properly lighted (if possible, with natural light), to allow the operator to identify the machine command and control devices.

Checking supply systems

Check that the main switch is in the “I” position. If this switch is in the”O” position, feed the machine by turning its lever until it is in the “I” position.

Control enabling and acquisition

Turn on the master switch located on the front side of the machine. A message (in English) is displayed for a few seconds (see Figure 6.15) showing the panel software version, followed by the main menu (see Figure 6.16) with the list of operating and maintenance selectable options.

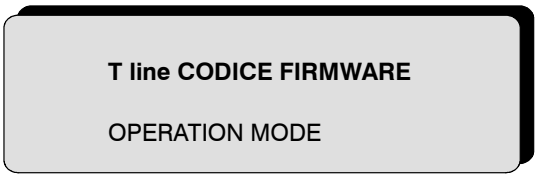


Figure 6.15 – Initial message

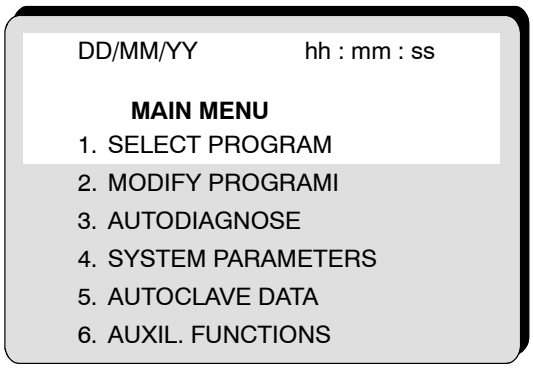


Figure 6.16 – MAIN MENU

To select the main menu options, press the key corresponding to the number displayed next to the option.

Table 6.19 shows the selectable options, corresponding to the sections dealing with the selection topics.

Table 6.19 – Menu selection and related sections

OPTION	RELATED SECTIONS
SELECT PROGRAM	6.4.5.3. Program start
MODIFY PROGRAM	6.5.2. Program parameter configuration
AUTODIAGNOSE	6.6.4. Self–diagnosis
SYSTEM PARAMETERS	6.5.3. Changing general parameters
AUTOCLAVE DATA	6.6.6. Sterilizer data
AUXIL. FUNCTIONS	6.7. Auxiliary functions

6.4.5.2. Panel functions and operation enabling

Starting from the main menu, press key ENTER for at least 2 seconds to have access to the function menu of man/machine interface, known as ”PANEL FUNCTIONS” (see Figure 6.17).

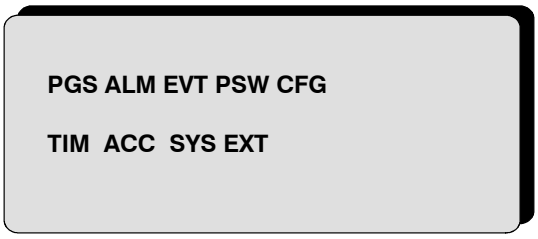


Figure 6.17 – PANEL FUNCTIONS menu

Through their enabling the operator can:

- enter the password (PSW);
- check the operator panel performance and adjust the display brightness (SYS);
- set the system date and time (TIM);
- Enter configuration data (PGS);
- Alarm list (EVT);
- Load the SW on the operator panel (CFG);
- Exit from the menu (EXT)

Functions ACC and ALM are not used.

The table below shows the password level required to have access to every panel function as well as the section dealing with it.

Table 6.20 – PANELFUNCTIONS, access levels and related paragraphs

OPERATOR PANEL FUNCTIONS	ACCESS LEVELS	REFERENCE SECTIONS
PSW	– all	6.4.5.2 . Panel functions and operation enabling
SYS	– all	6.6.3. Monitoring the operator panel
TIM	– FEDEGARI DEVELOPER – FEDEGARI PERSONNEL – USER SUPERVISOR	6.6.2. Changing date and time
PGS	– FEDEGARI DEVELOPER – FEDEGARI PERSONNEL	6.6.6. Sterilizer data
EVT	– all	6.6.5. Alarm list
CFG	– FEDEGARI DEVELOPER	–
EXT	– all	–

Operation enabling

To use the machine, the operator must enter his code (password) as follows:

1. From the main menu, press key [ENTER] for at least 2 seconds. The PANEL FUNCTION menu is displayed (see Figure 6.17);
2. Move with the keys, [→] and [←] light function PSW;
3. Press [ENTER] to confirm the selected option. A page is displayed to enter the access code;
4. Key in your password consisting of four numeric characters;
5. Press key [CLR] to confirm the password and to return to the main menu.

NOTE

For your privacy, the controller does not display the numeric characters entered and the code does not appear on the screen.

NOTE

When entering password 0000 or another password that is not recognized as programmed in the PASSWORD MODIFICATION function, the system will automatically configure at STAND–BY level. To return to the condition of use provided for the machine, re–insert one of the programmed keys, such as USER or SUPERVISOR.

6.4.5.3. Program start

1. Press key [1] to select option "SELECT PROGRAM" from the main menu. The page "SELECT PROGRAM" is displayed (see Figure 6.18) and you are required to enter a number corresponding to the program to be run.

If option ### Cycle repetit. is disabled

SELECT PROGRAM
Press <INS> and insert
the Program Nr. = > " 0 "

If option ### Cycle repetit. is enabled

SELECT PROGRAM
Press <INS> and insert
the Program Nr. = > " 0 "
Cycle Repetitions : --

Figure 6.18 – SELECT PROGRAM menu

2. Press [0 INS] (the numeric field is blinking) and key in the number corresponding to the program selected. Press

key [ENTER] to confirm.

3. If option ### Repeat Cycles is enabled, select the ”Repeat Cycle” field with keys [↑] and [↓]. Digitare il

   Enter the desired number of repetitions (max. 20). Press the [ENTER] key to confirm.

The controller will start the program, having checked that:

- The selected program is enabled by the machine software configuration;
- The printer, if any, is available, for cycle printing (general parameter PRINTER set to 1).

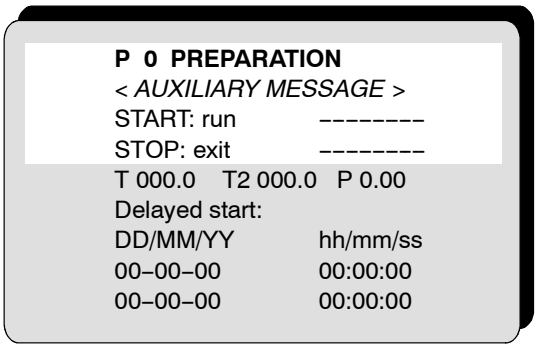
After the above mentioned checks, the controller displays the page corresponding to the first program phase, the ”PREPARATION” (see Figure 6.19).

The operator must make sure that the batch has been loaded in the chamber.
If it is not so, he will load it (see Section 6.4.5.4.) and close the cover as follows:

- Turn the cover while pressing the safety lever which keeps it released until the cover is closed (the microswitch controlling the cover closing is triggered);

- Press key [F5] on the keyboard, to let compressed air in the seal housing. When the LED located next to the key lights up [F5], the system receives the message that the chamber is closed and tight.

If option ### Cycle repetit. is disabled



If option ### Cycle repetit. is enabled

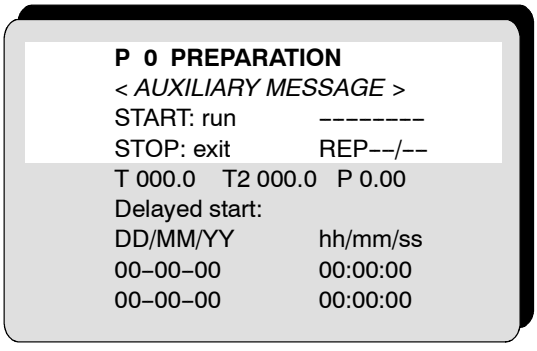


Figure 6.19 – PREPARING the sterilization cycle

4. Press key F1 START to complete the “PREPARATION” phase and to start the sterilization process, with register ”progressive program number” increasing and printed when the cycle is over (provided a printer has been installed and enabled). From now on, until the sterilization process is over, operating interactions other than chamber parameter monitoring are inhibited, except for CYCLE STOP and STEP–BY–STEP functions (enabled by Password).

NOTE

To return to main menu, without starting the sterilization program selected and increasing the progressive instruction register, press key F2 STOP instead of key F1 START .

NOTE

After the machine has been prepared, the operator can enable the sterilization program only if the cover is closed and the autonomous steam generator, properly installed, has given the controller the signal ”generator ready”.

NOTE

The machine can be loaded at any time after cover opening, also before its starting.

CAUTION!

To avoid pouring and/or stacking the product, check that its containers are perfectly fitted into the machine chamber before closing the cover.

6.4.5.4. Batch loading

1. Remove the heatprobe(s) from the sterilization chamber;
2. Place the baskets with the product to be processed inside the chamber;
3. Position the flexible heat probe **T001** and the auxiliary heat probe, if any, in the upper basket, so that their metal points touch the product.

NOTE

If the product to be sterilized consists of a liquid solution inside tightened bottles, the heat probe must be placed inside a sample bottle filled with deionized water. The sample bottle, positioned inside the chamber, in the upper basket, must be prepared according to the product characteristics.

CAUTION!

When extracted from the machine, bottles with more than 70°C internal temperature are likely to explode, thus endangering the operators. Therefore, to sterilize solutions kept in tightened bottles,

select only sterilization processes providing a suitable final cooling phase and sterile air counterpressure, which guarantee safety during the product extraction. The maximum safety temperature allowing to open the cover must be set at <70°C and the parameter "CHECK FINAL T" must be activated by setting value "1".

CAUTION!
To sterilize heat–sensitive products use containers with homogeneous size.

CAUTION!
If product containers have different sizes, place the heat probe in the largest container.

CAUTION!
Check that the heat probe cable(s) have been properly fitted in the chamber before closing the cover.

6.4.5.5. Process control

The operator can check the sterilization process in progress by reading the dedicated page displayed, i.e. the "process page".

This page includes and shows information based on two main categories: the first, known as "control parameters", supplies useful information (data allowing to identify the program and the phase in progress, set threshold values – pressure, temperature, time – as well as their related values, measured and processed in real time inside the sterilization chamber.

The second category concerns information named "alarm messages" and auxiliary messages.

Control data

During every phase, the control page informs the operator about:

- the number of the run program;
- the name of the phase in process;
- the preset threshold value (pressure, temperature or time), representing the target value of the phase in progress, starting the next phase;
- the temperature (°) measured in the sterilization chamber by heat probe **T001**;
- the pressure (bar) measured by pressure transducer **P001**;

- the phase time;
- F_0 (F_0 value, totalled by processing the temperatures measured by heat probe **T001**). It is calculated only if the machine features the option ”calculation and control with F_0 ”.
  If it is not so, F_0 is given value 0);
- the temperature (°) measured in the sterilization chamber by heat probe **T005** (if Option K80 is available);
- sterilization time “ts” (only during the sterilization phase);

By way of example, Figure 6.20 shows the process page of the HEATING phase.

If the machine is equipped with a printer enabled, the above mentioned process information can be displayed and printed at the beginning of every phase, according to the printing intervals set in the general parameters.

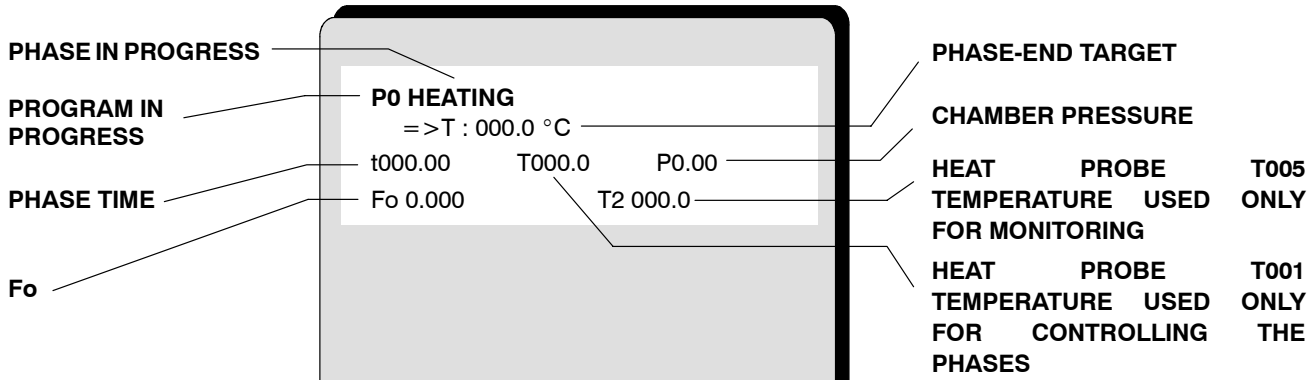


Figure 6.20 – Control page concerning the HEATING phase

NOTE

Press key F1 START at the 3 highest levels to enable the STEP–BY–STEP function. This function allows to pass from the phase in progress to the next one. Alarm ”PHASE STEP UTILIZED” is displayed and printed.

Press key F2 STOP at the 3 highest levels to enable the CYCLE STOP function. This function allows to enter the emergency phase. Alarm ”MANUAL PROGRAM–STOP” is displayed and printed. When key F2 STOP is pressed, the system enters the pressure balancing and cycle end phase.

Alarm messages

The sterilizer features up to twenty different alarms, displayed together with their short description and printed in real time if a printer is available.

All alarms raised generate visual and acoustic warnings which can be deactivated by pressing the ENTER key.

If the activated alarm must be acknowledged (ACK) the operator must hold the ENTER key down for a few seconds.

Such alarms are defined as system alarms when they concern general safety tools or conditions or as phase alarms when they are related to the execution of specific phases.

Top level alarms, e.g. the alarm indicating that the cover is not perfectly closed during the process, stop the cycle. Therefore, the autoclave enters the emergency phase, during which it is stopped n full safety.

In this EMERGENCY phase, key F2 STOP allows the operator to enter the pressure balancing and cycle end phase.

The machine described in this manual can enable, based on its configuration, all (full optional machine) or part of the alarms listed in Table 7.1 (see Section 7.1.).

CAUTION!
The operator must be perfectly acquainted with the meaning and importance of the machine alarms.

Auxiliary messages

Auxiliary messages consist of short text lines that are displayed in some screens to inform the operator about the machine and door state, as well as about the sterilization/test result.

The tables listing possible auxiliary messages and the relative screens are the following:

Tables 6.21 – Auxiliary messages

AUXILIARY MESSAGES displayed in screens:	
MAIN MENU FOR CYCLE END PREPARATION	**FINAL DATA**
READY TO START	TEST FAILED
CYCLE IN PROGR.	STERILIZATION FAILED
DOOR OPENING OK	TEST OK
DOOR OPEN	STERILIZATION OK
GENERATOR NOT READY!	DECONTAMINAT. FAILED
CONTAMINATION–LOCKED !	DECONTAMINATION OK
DELAY!	
REP ––/––	

Emergency phase

The sterilizer enters the emergency phase when one or several failures take place during the sterilization process, or when the machine is restarted after a black–out or through a manual command.

The emergency makes all valves close and stops all motors, with the sterilizer on stand–by.

This state protects the machine, the personnel and the batch.

The events causing the emergency phase, as well as the messages displayed for every phase and the procedures to exit from the emergency state are listed below.

Black–out emergency

The system enters the emergency phase when the sterilizer is restarted after a black–out.

Black–out starting and end time is displayed together with the sterilization chamber temperature, pressure and phase time.

Press key F2 STOP to enter the pressure balancing and cycle end phase or the decontamination emergency phase.

CAUTION!

Before entering the pressure balancing phase, check that temperature and pressure conditions allow for the operations required without damaging the batch.

In particular, let liquid products cool before pressing the key F2 STOP.

Decontamination program emergency

During the sterilization program execution, when function CYCLE STOP is activated during heating or sterilization, or when the cycle in progress is stopped by an alarm before decontamination (heating and sterilization phases), the sterilizer enters the emergency phase.

The sterilization chamber temperature and pressure as well as the phase time and the progressive cycle number are displayed. The operator can only switch the machine off.

When the machine is turned on again, the operator panel's display shows the "CONTAMINAT. LOCK !" message, that indicates that the valves involved in the pressure balancing in the chamber (E003 when the pressure in the chamber is below the minimum balancing pressure and E006 when the pressure in the chamber exceeds the maximum balancing pressure) are locked to prevent any microbiologic contamination hazard for the rooms and the products. Therefore, after solving the problem that has caused the decontamination Emergency, the operator can relaunch the cycle, being sure that no contaminated product has been in contact with the exterior of the chamber.

If the emergency causes result in the opening the chamber cover, the operator can manually remove the lock on the chamber's pressure balancing.

Press the 6 keys in the AUXILIARY FUNCTIONS menu. The following message is displayed:

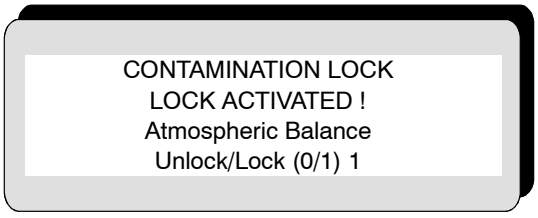


Figura 6.21 – CONTAMINATION LOCK message

Press [0 INS]: the lock is removed. To return to the main menu, press the [CLR] key.

Phase emergency

The system enters the emergency phase when function CYCLE STOP is selected or whenever an alarm stops the cycle in progress.

The sterilization chamber temperature and pressure are displayed together with the phase time.

Press key [F2 STOP] to enter the pressure balancing and cycle end phase.

End of process

When the program has reached the last phase, ”CYCLE END” , the sound signal is activated and the LED, positioned on the display side, starts blinking. After a set time (end of phase target) or when key [F2 STOP] is pressed, the sterilization program is over, the MAIN MENU is displayed and, if the printer is enabled, cycle end data are printed.

NOTE

The alarm message ”AUTOMATIC POWER OFF” is displayed after the cycle end phase; it indicates for 5 seconds that the machine is going to be manually switched off.

6.4.5.6. Batch unloading

CAUTION!

When extracted from the machine, bottles having an internal temperature of more than 70°C could explode, thus jeopardizing the operators. Therefore, to sterilize solutions kept in tightened bottles, select only sterilization processes providing a suitable final cooling phase and sterile air counterpressure, which guarantee safety during batch unloading. The maximum safety temperature allowing to open the cover must be set at <70° C and the parameter ”CHECK FINAL T” must be activated by setting value ”1”.

1. Open the cover as follows:

– Press the proper key [F4] on the keyboard to automatically exhaust air from the seal housing;

– Check that the key [F4] LED switches on;

– Press the lever which releases the cover from the mechanical locking system;

- Turn the cover until it is completely ope;
- Transfer the batch, by removing the flexible(s) heat probe(s);
- Place heat probe **T001** and auxiliary heat probe **T005**, if any, inside the empty sterilization chamber.

6.4.5.7. Deactivation or switching off

Usual or automatic stop

NOTE
Before turning the machine off, do not forget to enter the STAND–BY password (0000).

1. The sterilizer is usually shut–down by placing the master switch on the front panel of the machine in the <O> position.
2. To shut–down the machine automatically, use system parameter POWER RESET.
3. Check that the process controller is OFF (the LCD display must be switched off).

Emergency stop

WARNING!
Pressing the emergency push–button is likely to damage the sterilizer batch. The operator cannot restart the machine if this button has been pressed. Refer to the competent manager.

Press the mushroom–head emergency button located on the front panel of the machine to stop it immediately through the main switch. In this state, the machine works as in case of electric system black–out.

For further information, refer to Section 2.4.5. .

Emergency stops take place:

- when safety thermostats **T002** and **T003** (TÜV) of the autonomous steam generator are activated;
- when the cycle end “AUTOMATIC POWER OFF” option is activated.

Restarting the machine after an emergency stop

CAUTION
To avoid damaging the machine and jeopardizing the operators, check and remove the emergency cause before starting the sterilizer.

- Pull the emergency mushroom–head button to release it;

– To restart the machine, reset the main switch.

6.5. CONFIGURATION

6.5.1. General Information

The process controller features software functions to redefine and modify the machine sterilization and service programs, as well as to set a series of general parameters controlling operations and functions common to all cycles.

Two configuration modes are available:

– Program parameter configuration;

– System parameter configuration.

The operations required to configure these parameters are described below.

The operator can modify these functions only if password level “USER SUPERVISOR” is available.

6.5.2. Program parameter configuration

To modify program parameters (phase parameters and phase selection):

– Select option ”MODIFY PROGRAM” from the main menu by pressing key [2] ;

A message (see Figure 6.22) is displayed, introducing the program parameter pages;

– Press the alphanumeric key corresponding to the program whose parameters must be modified to have access to the new page. Figure 6.23 shows program 5;

– Scroll the selected page using keys [↑] and [↓] , until the parameter to be modified is displayed;

– Press [0 INS] to enter data;

– Select the desired parameter using keys [↑] and [↓] ;

– Key in the desired value in the lighted numeric field;

– Press [ENTER] to store the modification on the process controller;

– Press [CLR] to return to the main menu.

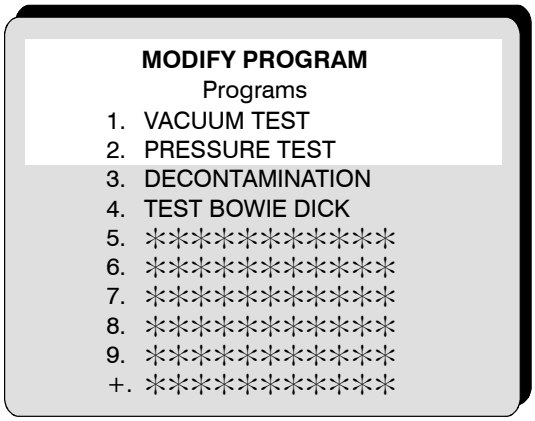


Figure 6.22 – Program Parameter Modification menu

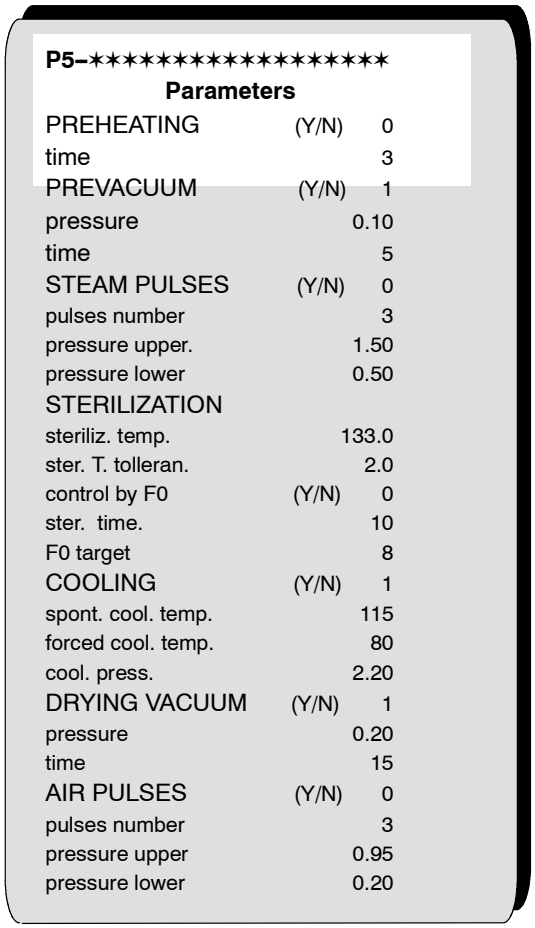


Figure 6.23 – Program Parameter page (e.g. program 5)

NOTE

Program parameter pages can be scrolled either in direct sequence (press key →) or in reverse order (press key ←).

NOTE

To cancel parameter modifications, press key CLR instead of key ENTER.

NOTE

Press key 0 INS to enter data and to lock scrolling of the selected page. Arrow keys ↑ and ↓ allows the operator to move inside the displayed parameter fields. To scroll pages again, press key ENTER.

6.5.3. Changing general parameters

During the sterilization program execution, the machine operation is controlled by specific parameters as well as by a series of general parameters, controlling operations and functions common to all sterilization processes.

To set system parameter values:

- Press key 4 to select option ”SYSTEM PARAMETERS” from the main menu. The general parameter page (Figure 6.24) is displayed with current values;
- Scroll the selected page using keys ↑ and ↓, until the parameter to be modified is displayed;
- Press 0 INS to enter data;
- Press keys ↑ and ↓ to select the desired parameter field;
- Enter the desired value in the numeric field next to the parameter;
- Press ENTER to store the modification on the process controller;
- Press CLR to return to the main menu.

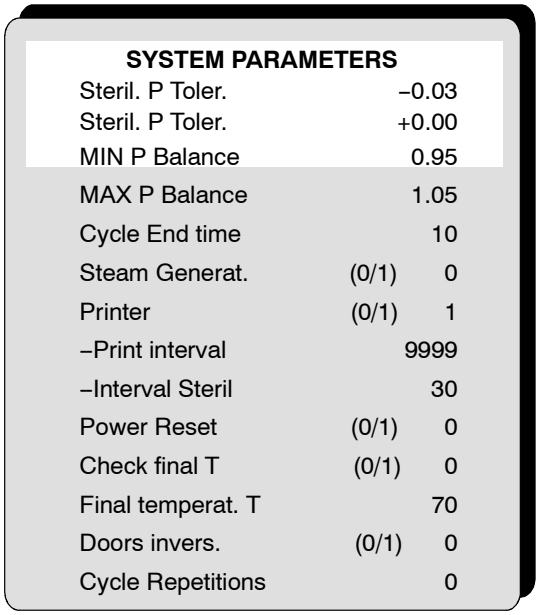


Figure 6.24 – System parameters

NOTE

To cancel parameter modifications, press key CLR instead of key ENTER .

NOTE

Press key 0 INS to enter data and to lock scrolling of the selected page. Arrow keys ↑ and ↓ allows the operator to move inside the displayed parameter fields. To scroll pages again, press key ENTER .

6.6. CONTROL SYSTEM MAINTENANCE

6.6.1. General information

Maintenance includes all operating modes allowing to service and/or control several software functions as well as operating logics.

Three maintenance procedures are available:

- Checking the operator panel performance;
- Programming the clock/internal calendar (date and time);
- Self–diagnosis and calibration operating procedures.

Function maintenance and control operations will be described below.

6.6.2. Changing date and time

The operator panel features an internal clock supplied by a battery which constantly updates date and time, even in case of black–out.
Then operator can set or modify current date and time:

- From the main menu, press [ENTER] for at least 2 seconds.
  The panel function menu is displayed;
- Select parameter TIM using keys [➡] and [⬅] ;
- Press [ENTER] to confirm your choice, the system date and time fields are displayed (see Figure 6.25);
- Enter the desired numeric value in the lighted field, using the keyboards;
- Press [ENTER] to reach the next field and to repeat the previous operation, if required;
- Press [CLR] to return to the main menu.

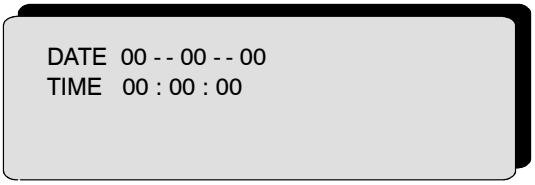


Figure 6.25 – Programming date and time

6.6.3. Monitoring the operator panel

The machine features a software device to check ON LINE the Operator Panel performance.
This check allows to monitor the performance of the operator panel battery, of LEDs, of panel communication with PLC and printer (if any) and to adjust display brightness.

To check the operator panel:

- From the main menu, press ENTER for at least 2 seconds. The panel function menu is displayed;
- Press keys → and ← to light function ”SYS”;
- Press ENTER to confirm the selected option : the panel AUTODIAGNOSE page is displayed (see Figure 6.26);
- Press keys ↑ and ↓ to select different options;
- Select line ”DISPLAY”. To modify the display brightness press keys → and ← ;
- Light the battery line and check its performance;
- Light line ”PLC” and check, through the related message, the panel/PLC connection;
- Light line ”PRINTER” and check, through the related message, the printer/panel connection;
- Press CLR to return to the main menu.

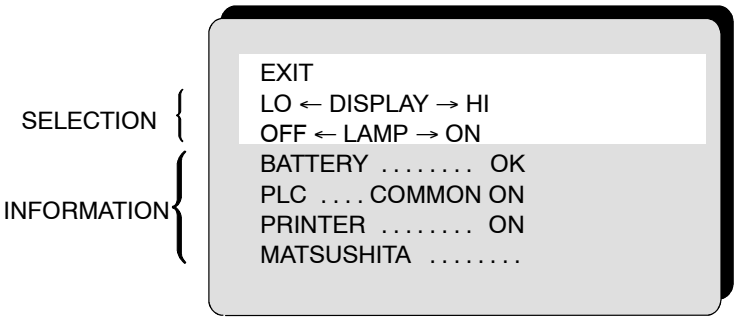


Figure 6.26 – Operator Panel Autodiagnose menu

6.6.4. Autodiagnose

The process controller features a self–diagnosis device “AUTODIAGNOSE”, in order to check:

- digital input/output parameter values;
- system analog inputs;

Calibrate temperature and pressure measured in the sterilization chamber (see Sections 8.3.4.10. and 8.3.4.11.).

6.6.5. Alarm List

Start function ”EVT”, from the panel function menu, to display a specific page which shows, through a keyboard control, all activated alarms, starting from the last one.

For each alarm, this page displays:

- its progressive number;
- the type of transition ”STATUS” of the detected situation:
  - ”ON” = alarm activated;
  - ”OFF” = alarm deactivated;
  - ”ACK” = alarm acknowledged.
- The alarm description:
- the alarm starting date and time.

To display the page “alarm list”:

- Start from the main menu;
- Press [ENTER] (for at least two seconds): the panel function menu is displayed;
- Press keys [➡] and [⬅] to select function ”EVT”;
- Press key [ENTER] to confirm your choice. The latest alarm activated is displayed;
- Press key [➡] to display recorded alarms.

NOTE

Press key [9 PRN] to print all detected alarms, starting from the first one. The operator cannot access the alarm list page if no alarms have been stored.

6.6.6. Sterilizer data

Press key [5] from the main menu to select option ”AUTOCLAVE DATA” and to access the page showing the sterilizer general data (see Figure 6.27).

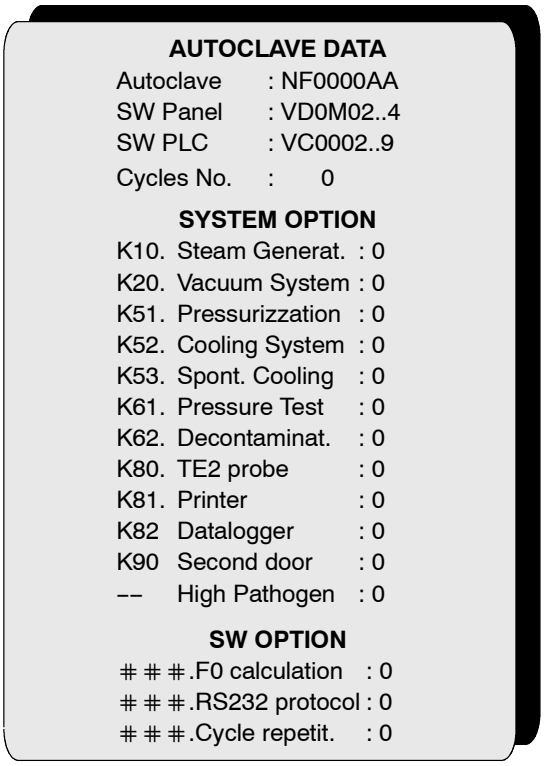

AUTOCLAVE DATA
Autoclave : NF0000AA
SW Panel : VD0M02..4
SW PLC : VC0002..9
Cycles No. : 0
SYSTEM OPTION
K10. Steam Generat. : 0
K20. Vacuum System : 0
K51. Pressurizzation : 0
K52. Cooling System : 0
K53. Spont. Cooling : 0
K61. Pressure Test : 0
K62. Decontaminat. : 0
K80. TE2 probe : 0
K81. Printer : 0
K82 Datalogger : 0
K90 Second door : 0
-- High Pathogen : 0
SW OPTION
###.F0 calculation : 0
###.RS232 protocol : 0
###.Cycle repetit. : 0

Figure 6.27 – AUTOCLAVE DATA menu

6.7. AUXILIARY FUNCTIONS

1. Select the ”AUXILIARY FUNCTIONS” option in the main menu, by pressing the 6 key on the keyboard.

2. Use the ↑ and ↓ keys to select the various options.

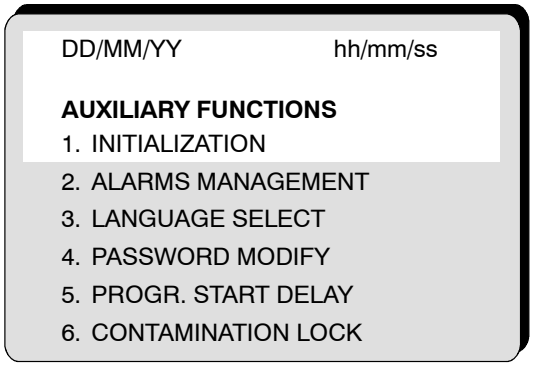


Fig. 6.28 – AUXILIARY FUNCTIONS menu

6.7.1. Transferring system regulation data

1. Select option ”INITIALIZATION” from the AUXILIARY FUNCTIONS menu, by pressing the [1] key on the keyboard. A confirm message is displayed to proceed with this operation.
2. On request the displayed message press [ENTER] . After about one minute, i.e. the time required to complete data transfer, the main menu is displayed again.

NOTE

The “INITIALIZATION’ must be carried out during the installation phase only. However, system performance is not damaged if this function is initialized by fault.

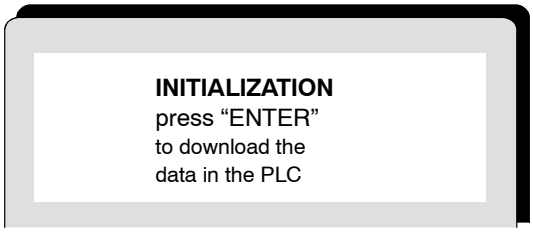


Figure 6.29 – Message displayed during data transfer

6.7.2. Managing the stored alarm list

Press key [2] in the AUXILIARY FUNCTIONS menu. The ”ALARMS MANAGEMENT” option is selected and you can have access to the page showing the alarm management option list (see Figure 6.30).

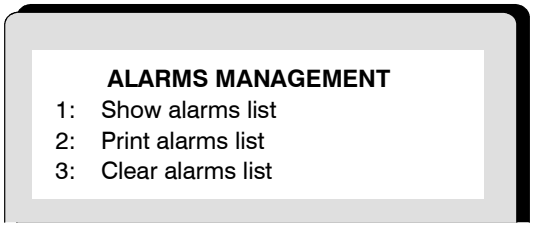


Figure 6.30 – ALARM MANAGEMENT Page

– Press keys [↑] and [↓] to select the available options;

1. Press key [1] to display the alarm list.

– Scroll the selected page through key [↑] and [↓] .

2. Press key [2] to print the alarm list.

3. Press key [3] to cancel the alarm list content (only with password, in USER SUPERVISOR mode).

6.7.3. Language select

Press key [3] from the AUXILIARY FUNCTIONS menu to select option ”LANGUAGE SELECT” and have access to the page allowing to choose the message language (see Figure 6.31).

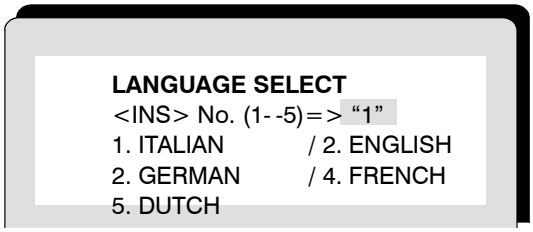


Figure 6.31 – LANGUAGE SELECT Page

– To choose the desired language, press keys [0 INS] followed by key [1] or [2] or [3] or [4] or [5].

NOTE
The selection of language No. 5 (DUTCH) is implemented only upon specific request

6.7.4. Modify password

Press key [4] from the AUXILIARY FUNCTIONS menu to select the ”PASSWORD MODIFY” option and access the page in which it is possible to modify the ”user” level password (see Figure 6.32).
The ”user” passwords (Supervisor and User) may be modified by user only at the supervisor level.
When loading the software, ”user” passwords will be reset at the initial values. Moreover, when forgetting the modified password, it is necessary to remove the battery from the operator panel for at least 10 minutes, so that initial ”user” passwords may be reset (enter all values previously set, such as, for example, program, calibration, date and time values etc.). The original password USER SUPERVISOR” (cf. para. 6.3.1.) of Step–by–Step and Stop functions, cyclically used, shall remain always the same, since it is managed by the Controller and not by the Operator Panel.

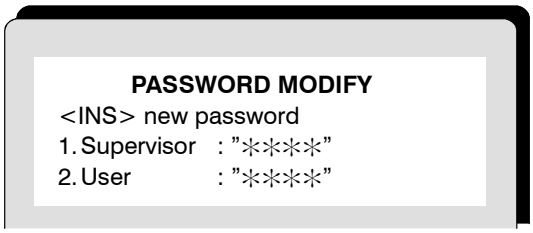


Figura 6.32 – PASSWORD MODIFY page

6.7.5. Delayed start

Press the [5] key in the AUXILIARY FUNCTIONS menu to select the "PROGRAM START DELAY" option and to access the page from which you can select the delayed start of a program (cf. Figure 6.33).

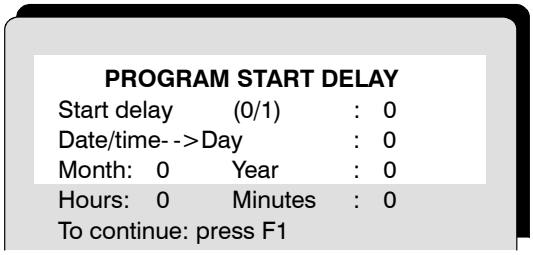


Figure 6.33 – PROGRAM START DELAY page

1. Press the [0 INS] key and, then, the [1] key to activate the "PROGRAM START DELAY" parameter (0/1).
   Press the [ENTER] key to confirm.

2. Press the [0 INS] key; use keys [↑] and [↓] to position on the "Day" field and enter the number of the day on which the program will start.
   Press the [ENTER] key to confirm.

3. Repeat this operation for the "Month", "Year", "Hours" and "Minutes" field, entering the date and time for the delayed start of the program.

4. Press [F1 START] to go to the program selection; use keys [↑] and [↓] to position on the "Progr. No." field and enter the number of the selected program.
   Press the [ENTER] key to confirm.

After entering the program number ("Progr. No.") the process controller will check that:

– the selected program is enabled by the machine's SW configuration;

– the printer, if any, is available, if activated by the operator for cycle printing ("PRINTER" system parameter set to 1).;

After these checks, the process controller displays the page corresponding to the first phase of the program, known as "PREPARATION" (cf. Figure 6.34).

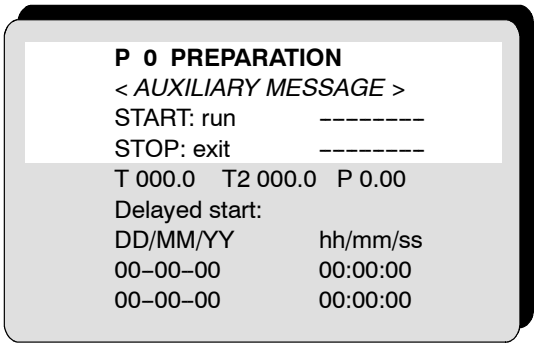


Figura 6.34 – PREPARATION page (sterilization cycle)

The operator must insert the product in the chamber (cf. Para. 6.4.5.4.), unless this operation has already been performed, and must close the cover.
Once the Date/time set for the delayed start is reached, the "PREPARATION" phase is over and the sterilization cycle is automatically started.
The "progressive program number" counting increases and will be printed at the end of the cycle (if the printer is enabled).
All operations are inhibited until completion of the cycle, apart from the monitoring of chamber parameters, and the Step–by–Step and Cycle Stop functions.

NOTE

The program number must be entered the last, because it may provide access to the "PREPARATION" phase even if the other parameters have not been entered.

NOTE

If you don't want to run the "delayed" program, simply press the F2 STOP key or turn the machine off in the "PREPARATION" phase.

NOTE

If, in the "PROGRAM START DELAY" menu, the "Start dealy" parameter is set at 1 and a preceding date or hour (or both) is/are set, the controller enter the "PREPARATION" phase and doesn't live it until aborted by pressing the F2 STOP key or turning the machine off.

The F1 START key, if pressed, doesn't run the program.

NOTE

If, in the ”PROGRAM START DELAY” menu, the ”Start dealy” menu is set at 0, regardless of the date and hour values, the controller enter the ”PREPARATION” phase and doesn’t live it until aborted by pressing the F1 START key, starting the program.

NOTE

If, when the date/hour set for the start are reached the door is still open, the program doesn’t start. The program will be run only after closing the door.

NOTE

If, when the date/hour set for the start are reached, the steam generator is ”not ready”, the program doesn’t start. The program will be run only with the generator’s permission.

7. ALARMS AND FAULT FINDING

7.1. ALARMS

The sterilizer has up to 20 alarms, displayed together with a short description and printed (if a printer is available).

The operator is informed about activated alarms by visual and acoustic warnings.

System alarms concern safety tools and conditions. Phase alarms relate to specific phases to be carried out.

Top–level alarms (e.g. cover not perfectly closed during the process) stop the cycle in progress. The sterilizer enters the emergency phase and is kept in full safety.

Press key [F2 STOP] and key in the required password in order to enter pressure balancing and cycle end phase.

All alarms refer to temporary failures or to other failures which might require engineers' assistance.

Based on its configuration, the sterilizer described in this manual can enable all (machine full optional) or part of the alarms listed in Table 7.1.

The meaning of the Table fields is the following:

- **No.** : alarm number
- **ALARM** : alarm message
- **IN CYCLE** : period in which an alarm may be triggered.
- **CAUSE** : description of failures detected by the controller
- **TYPE** : Alarm type
- **DELAY** : delay in the alarm activation;
- **RESULT** : How the alarm affect the sterilizer
- **CIC** : Acoustic warning
- **PRINT ON** : Print (alarm activated)
- **PRINT OFF** : Printing alarm disabling.
- **ACK** : Acknowledgment request

NOTE

Symbols TE1, TE2 and PT of alarm messages correspond to thermal probes T001 and T005 and pressure transducer P001 respectively.

NOTE

Several alarms require the operator's acknowledgment (ACK message blinking).

Press key [ENTER] for at lest 5 seconds to erase the "alarm acknowledgment" message.

Table 7.1 – Alarm message configuration

N.	ALARM	IN CY-CLE	CAUSE	TYPE	DE-LAY	RESULT	CIC	PRINT ON	PRINT OFF	ACK
1	VACUUM PUMP ALARM	X	The Controller has sent the vacuum pump the starting signal (PV01), but does not receive any return signal (TPPV).	System	10	Display	X	X	X	
2	STER. TEMP. EXCESS	X	During the sterilization phase, the chamber temperature exceeds the sterilization temperature plus the sterilization tolerance (V10+V11).	Phase (STER.)		Display	X	X	X	
3	STER. TEMP. LACK	X	During the sterilization phase, the chamber temperature is lower than the sterilization temperature (V10).	Phase (STER.)		Display and susp. steriliz. time	X	X	X	
4	TE1 UNSERVICEABLE	X	The chamber temperature measured by the process controller exceeds the measuring range of heat probe TE1 (T001) or the process controller does not receive any signals from TE1 (T001).	System	5	Display and EMERG.	X	X		X
5	PT UNSERVICEABLE	X	The chamber temperature measured by the process controller exceeds the measuring range of pressure transducer PT (P001) or the process controller does not receive any signals from PT (P001).	System	5	Display and EMERG.	X	X		X
6	STEAM WATER LACK		The controller receives from level sensor (L002) the signal which indicates a lack of water in the autonomous steam generator. Note: this alarm is enabled only if the optional heat probe is working (Opt. K10 = 1 and system param. S5=1)	System	60	Display	X	X	X	
7	TE2 UNSERVICEABLE	X	The chamber temperature measured by the process controller exceeds the measuring range of heat probe TE2 (T005) or the process controller does not receive any signals from TE2 (T005).Note: this alarm is enabled only if the optional heat probe is working (Opt. K80 = 1)	System	5	Display and EMERG.	X	X		X

N.	ALARM	IN CY-CLE	CAUSE	TYPE	DE-LAY	RESULT	CIC	PRINT ON	PRINT OFF	ACK
8	LEAK TEST ALARM	X	During the sterilizer leak test, the controller detects a chamber pressure exceeding the programmed limits. Note: the variation in pressure is referred to the initial pressure value of the phase.	Phase (VA-CUUM TEST and PRESS TEST)		Display and test failure	X	X		
9	OVERTEMPER ATURE	X	The process controller measures the chamber temperature, which is higher than the set limit (141°C, 155°C for the FVA–HT model).Note: to avoid any false alarms if TE1 is unserviceable, this alarm is activated only for values below 150°C (200°C for the FVA–HT model).	System		Display and EMERG.	X	X		X
10	OPEN DOOR IN CYCLE	X	During the cycle, the process controller warns the operator that the cover is not perfectly closed. (Signal P002 not available)	System		Display and EMERG.	X	X		X
11	AUTOMATIC POWER OFF	X	Displayed and printed on CYCLE completion, when the machine automatic switch off has been required.	System		Display	X	X		X
12	MANUAL PROGRAM–STOP	X	Displayed and printed, during a cycle, after selecting CYCLE STOP function.	Phase (all phases with stop enabled)		Display and EMERG.	X	X		
13	PHASE STEP UTILIZED	X	Displayed and printed, during a cycle, after selecting STEP–BY–STEP function	Phase (all phases with P–P enabled)		Display and Phase end	X	X		
14	BLACK OUT DETECTED	X	Alarm displayed or printed, when a new cycle is started after a Black Out	System		Display and EMERG. B.O.	X	X		
15	PRINTER ERROR		When starting a cycle, after selecting the program No., check that the printer is available. (Opt. K81 = 1 and system Param. S6 = 1). If it is not so, the alarm is activated and the cycle is not selected.	System (cycle selection)		Display and progr. sel. denied	X	X		X

N.	ALARM	IN CY-CLE	CAUSE	TYPE	DE-LAY	RESULT	CIC	PRINT ON	PRINT OFF	ACK
16	DOOR–SYSTEM ALARM	X	The process controller detects an operating anomaly on inputs (limit stops and pressure switches of the door system).	System	5	Display and EMERG	X	X		X
17	PLC IN ERROR		Activated in case of a autodiagnose error.	System		Display	X	X		X
18	PLC BATTERY LOW		Activation in case of discharged or missing battery. The alarm is activated before the battery is completely discharged. Replace the battery to avoid loosing all the data contained in the RAM.	System		Display	X	X		
19	PANEL 1 BATTERY LOW		Activation in case of discharged or missing battery. The alarm is activated before the battery is completely discharged. Replace the battery to avoid loosing all the data contained in the RAM.	System		Display	X	X		

CAUTION!

The operator must be perfectly acquainted with machine alarms which could be activated.

7.2. FAULT FINDING

This section provides information on fault finding (e.g. alarms activated, vibrations, unusual noise).

To this end, the operator can use a diagnostic device (”AUTODIAGNOSE”), allowing to check system/computer performance, through analog and digital input/output channels.

CAUTION!

All jobs on the machine, including the access to live elements and main feed lines, must be carried out by FEDEGARI’s skilled personnel, or must be authorized by the manufacturer.

7.3. FAULT DETECTION PROCEDURES

Table 7.2 shows the commonest failures which might take place during the sterilizer operation.
The following table identifies their possible causes as well as the related troubleshooting

Table 7.2 – Fault detection

ALARM NO.	DESCRIPTION	POSSIBLE CAUSES	TROUBLESHOOTING
1	The controller has sent the vacuum pump **PV01** the start signal (PV01) without receiving the return signal (TMPV). The alarm message "VACUUM PUMP ALARM " is displayed.	a) Pump **PV01** feed circuit failure.	a) Based on wiring, try to identify and repair such failure. Check relay **K1** performance.
2	During the sterilization phase, the chamber internal temperature exceeds the sterilization temperature added to the sterilization tolerance (V10 + V11). The alarm message "STER. TEMP. EXCESS" is displayed.	a) The sterilizer is fed with overheated steam. b) Faulty heat probe **T001** or pressure transducer **P001** c) Heat probe **T001** or pressure transducer **P001** are not properly calibrated. d) The conversion module of sensor signals does not work properly.	a) Reset pressure in the saturated steam supply line. b) Identify the faulty element and replace it. c) Calibrate the system based on the signal coming from heat probe or transducer. d) Identify the faulty element and replace it.
3	During the sterilization phase, the chamber temperature drops below the minimum sterilization temperature (defined as system parameter). The alarm message "STER. TEMP. LACK" is displayed.	a) The sterilizer is fed with low pressure steam. b) Faulty heat probe **T001** or pressure transducer **P001**. c) Heat probe **T001** or pressure transducer **P001** are not properly calibrated. d) The conversion module of sensor signals is not working properly.	a) Reset pressure in the saturated steam supply line. b) Identify the faulty element and replace it. c) Calibrate the system on the signal coming from the probe or transducer. d) Identify the faulty element and replace it.

ALARM NO.	DESCRIPTION	POSSIBLE CAUSES	TROUBLESHOOTING
4	The internal chamber pressure measured by the process controller is higher than the measuring range of heat probe **T001**. – The alarm message "TE1 UNSERVICEABLE" is displayed. The cycle stops and the system enters the emergency phase.	a) Faulty heat probe T001 or conversion module of the detected signal.	a) Identify the faulty element through the self–diagnostic functions, repair or replace it.
5	The chamber pressure measured by the process controller exceeds pressure transducer **P001** measuring range. – The alarm message " PT UNSERVICEABLE" is displayed. – The cycle stops and the system enters the emergency phase.	a) Faulty pressure transducer **P001** or conversion module of the signal detected by the transducer.	a) Identify the faulty element through the self–diagnostic functions, repair or replace it.
6	Level sensor L002 indicates that the autonomous steam generator D001 is empty.The alarm message " STEAM WATER LACK" is displayed.	a) No water is available. A possible cause, apart from the lack of water, may be the presence of air bubbles in the pump suction duct. In this case, let the pressure out of the generator, by opening manual valve V004 (that must be closed once the generator is empty). After this operation, the deionized water supply can be restored. b) Faulty autonomous steam generator water pump **PA01**. c) Dirty or faulty supply valves. d) Faulty level sensor **L002**.	a) Reset demineralized water supply. b) Repair or replace the water feed pump **PA01** to the autonomous steam generator. c) Check water feed line to the autonomous steam generator. d) Identify the faulty element, repair or replace it. Replace the level sensor **L002**.

ALARM NO.	DESCRIPTION	POSSIBLE CAUSES	TROUBLESHOOTING
7	The chamber temperature measured by the process controller exceeds the measuring range of heat probe **T005.** – The alarm message "TE2 UNSERVICEABLE" is displayed.	a) Faulty heat probe **T005** or conversion module of the detected signal.	a) Identify the faulty element using the AUTODIAGNOSE function, repair or replace it.
8	During the leak test, the sterilization chamber pressure measured by the controller exceeds set limits. The message "LEAK TEST ALARM" is displayed.	a) Faulty or dirty fluid loading/unloading valves. **Valves** **Function** S003 Air inlet S008 Steam inlet S006 Drain E071 Steam inlet (K62) E007 Steam control (K61)	a) Identify faulty vale(s), clean or repair it/them.
9	The chamber temperature measured by the process controller exceeds the set limit (141°C): (155°C for the FVA–HT model): – The alarm message "OVERTEMPERATURE" is displayed. – The cycle stops and enters the emergency phase.	a) Faulty solenoid valve loading steam inside the chamber **E008**. b) Saturated steam supply valve open **S008**.	a) Repair or replace solenoid valve **E008**. b) Repair or replace supply valve **S008**.
10	During the cycle, the process controller warns that the cover is not perfectly closed: – The alarm message "OPEN DOOR IN CYCLE" is displayed. – The cycle is stopped and enters the emergency phase.	a) Faulty pressure switch **P002** detecting "high pressure" in the cover seal. b) No compress air available in the cover seal.	a) Replace pressure switch **P002**. b) Check the compressed air supply circuit. Identify the faulty element and replace it.
	During forced cooling, the fan **CV12** does not start.	a) Mechanical heating element in the system. b) Short–circuiting fan.	a) Repair or replace the fan **CV12**. b) Repair or replace the motor **ME12**.
	Water leaks in the vacuum pump **PV01** or in the autonomous generator feed pump **PA01**.	a) Faulty seals.	a) Replace seals.

ALARM NO.	DESCRIPTION	POSSIBLE CAUSES	TROUBLESHOOTING
15	After selecting the sterilization program, the message "PRINTER ERROR" is displayed.	a) The printer has been activated (system parameter PRINTER = 1), but is not available on the sterilizer. b) The printer is not fed.	a) Switch printer off. b) Check printer connection to the controller and the electric mains.
	The sterilizer cannot be started because the main switch trips several times.	a) Internal short–circuit. b) The electric cubicle is open. c) The generator safety thermostat **T003** (TÜV) is activated. d) Thermostat **T002**, protecting the generator heating elements is activated.	a) Identify and remove failure, according to the wiring diagram. b) Close the electric cubicle by means of its key. c) Remove the cause of dry operation, which has made heating elements work with low water level.
	The vacuum pump **PV01** does not start.	a) No activation signal of the process controller. b) Opening of the magnetothermal power switch. c) Faulty pump **PV01**.	a) Identify the failure through self–diagnostic functions. b) Identify the circuit failure downstream the magnetothermal power switch. c) Repair or replace the pump **PV01**.
	When the cycle is in progress, the controller does not receive the ready generator signal.	a) Faulty regulation pressure switch **P004**. b) Faulty autonomous generator heating system.	a) Replace pressure switch **P004**. b) Check performance of electric heating elements and of their electric feed circuit.

7.3.1. Autodiagnose functions

The process controller features a diagnostic instrument, known as "AUTODIAGNOSE".

This tool allows to check digital input/output channels as well as analog inputs. To access this tool:

1. Press key to select option "AUTODIAGNOSE" from the main menu. The following menu will be displayed

(see Figure 7.1):

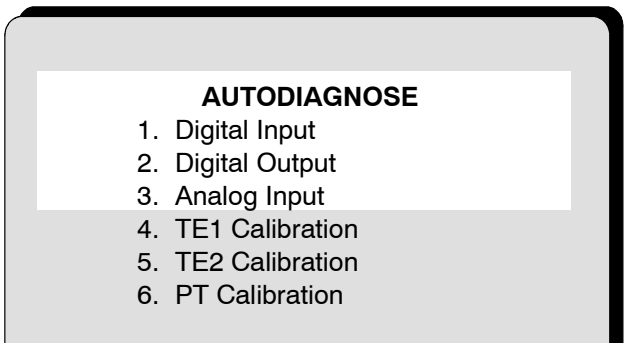


Figure 7.1 – AUTODIAGNOSE menu

2. Select the desired option by pressing the key corresponding to the number displayed next to the option, on the main menu.

   – Press 1 to access the page displaying the digital input state (see Figure 7.2). The state of the corresponding channel (0 = OFF, 1 = ON) is displayed below line 0123456789ABCDEF.

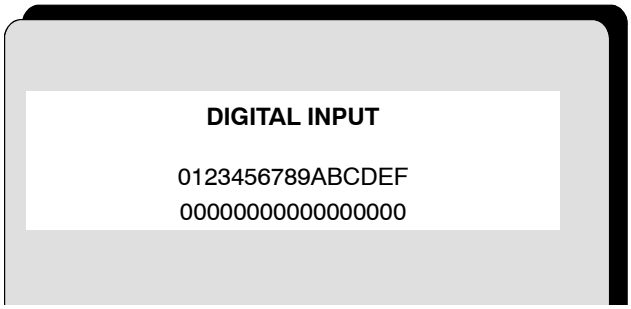


Figure 7.2 – DIGITAL INPUT menu

   – Press key 2 to access the page for displaying and modifying digital outputs state (see Figure 7.3). The state of each channel (0 = OFF, 1 = ON) is displayed below line 0123456789ABCDEF.

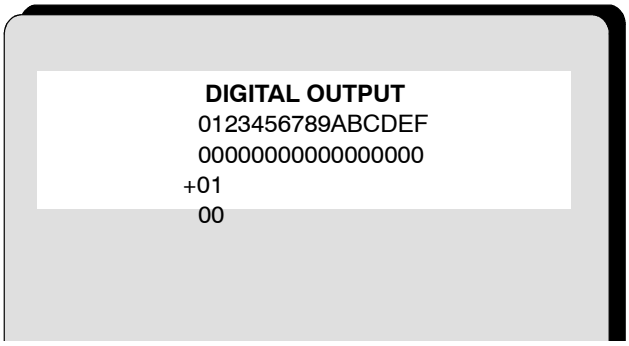


Figure 7.3 – DIGITAL OUTPUT menu

To modify a channel state:

* Press [0 INS] to enter data;
* Select channels using keys [→] and [←]; activate the channel by selecting key [1] or deactivate it through key [0 INS];
* Press key [ENTER] to store the modification.

NOTE

The channels related to solenoid valves for the seal compressed air and analog module outputs cannot be modified.

– Press key [3] to access the page displaying the chamber Temperature and Pressure (see Figure7.4);

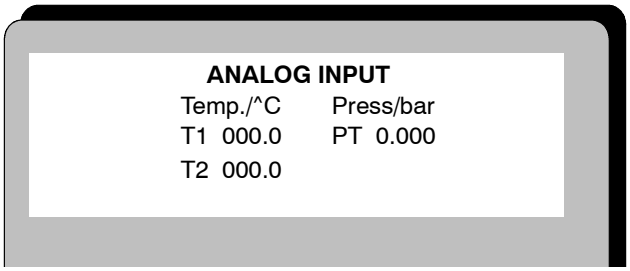


Figure 7.4 – ANALOG INPUTS menu

Table 7.3 – PLC input/output digital channels and related field devices

	OUTPUT				INPUT		
N	**Letters**		**Description**	**Opt**	**Letters**	**Description**	**Opt**
0	**RESET**	●	main switch reset	**--**		FREE	**--**
1	**E071**	●	decontamination steam and fan	**K62**	**Z001**	door limit switch	**--**
2	**CIC**	●	buzzer	**--**	**P002**	door seal high pressure	**--**
3	**E003**	○	chamber air valve	**--**	**P003**	door seal low pressure	**--**
4			FREE	**--**	**P005**	chamber safety pressure switch	**--**
5	**E005**	●	cooling valve (H2O+fan)	**K52**	**L002**	no water available in the steam generator	**K10**
6	**E006**	○	drain valve and PV vacuum	**--**		FREE	**--**
7	**E007**	●	condensate purge valve	**K61**		FREE	**--**
8	**E008**	●	chamber steam supply valve	**--**		FREE	**--**
9			FREE	**--**	**OKG**	generator consent	**K10**
A	**E010**	●	chamber compressed air valve	**K51**		FREE	**--**

	OUTPUT				INPUT		
N	**Letters**		**Description**	**Opt**	**Letters**	**Description**	**Opt**
B	**PV01**	●	vacuum pump	**K20**	**TMPV**	vacuum pump return	**K20**
C	**E012**		door seal press. valve	**--**		FREE	**--**
D	**E013**		door seal depress. valve	**--**		FREE	**--**
E	**YE**	**X**	ENABLE module ADPLC/F32	**--**		FREE	**--**
F	**YF**	**X**	CLOCK module ADPLC/F32	**--**	**XF**	SDATA module ADPLC/F32	**--**
+0	**E014**	●	”out- -of- -cycle” signal	**--**		FREE	**--**
+1	**E015**	●	”cycle- -in- -progress” signal	**--**		FREE	**--**

● = digital outputs that can be manually activated in SELF–DIAGNOSIS and are reset to OFF when a program is run.

○ = digital outputs that can be manually activated/deactivated in SELF–DIAGNOSIS, and that are reset to OFF when a program is run. Their forced deactivation can be overwritten by the automatic control. Therefore, if the system activates this output automatically, any deactivation attempt is useless (even though the system displays that the ”forced” state of the output has been reset to OFF).

X = digital outputs continuously and automatically controlled by the process controller; they cannot be activated/deactivated manually in SELF–DIAGNOSIS.

8. MAINTENANCE AND SERVICING

8.1. GENERAL WARNINGS

WARNING

Correct and timely maintenance allows to prevent most failures and to assure proper performance and durability of the machine.

CAUTION!

Always CARRY OUT scheduled maintenance suggested in this manual.
Perform periodical top level maintenance and related overhauls as recommended by FEDEGARI.
The machine must be checked at least every year or after no more than 400 cycles.
The manufacturer shall not be liable for any failure or damage due to total or partial non–compliance with the above mentioned scheduled times and procedures.

NOTE

Electric motors overloads are usually due to mechanical failures, causing vibrations and unusual noise, which deserve the operator's attention from the beginning.
If in doubt, do not hesitate to contact FEDEGARI's Service Centers.

8.2. FOREWORD

Maintenance jobs indicated in this section have been defined after a careful exam of average machine performance and use. For different needs, please contact the manufacturer.

This chapter identifies preventive maintenance (sections 8.3. and 8.4.) as well as troubleshooting.

8.3. PREVENTIVE MAINTENANCE

8.3.1. General information and warnings

This section explains ordinary preventive maintenance procedures, based on different steps. It informs the operator about any warnings, maintenance schedules, tools, materials and equipment to be used for maintenance.

These procedures are organized according to the following topics:

- Visual inspection;
- Cleaning;

– Scheduled performance tests.

CAUTION!

Be careful to carry out maintenance with suitable work clothing, fit to protect the operator from contusions, abrasions and burns deriving from contact with hot fluid jets.

CAUTION!

Before maintenance of the sterilizer, ALWAYS stop it, unless otherwise provided, by disconnecting the master switch and the equipment from the power supply network.

8.3.2. Visual inspection

Check the plant and its main components every week, according to the instructions of the following sections.

8.3.2.1. Preliminary operations

1. Check work reports to make sure that the last sterilization cycle has been successfully completed.

CAUTION

Do not carry out maintenance if you are not sure that the working environment is free from chemicals, bacteria and microbes, i.e. until successful completion of the previous sterilization cycle, when the batch has been sterilized without any leaks (broken or open vials, bags, containers etc.).
All maintenance jobs carried out in environments with chemicals, bacteria or microbes MUST BE authorized by the competent bodies of the sterilizer owner and performed using suitable protective equipment, in conformity with the safety rules of the country where the machine is used.

2. Check that the machine cover is open;
3. The cover being closed, check that the chamber pressure corresponds to atmospheric pressure and that temperature corresponds to room temperature (10%);
4. Check that the machine and the process controller are switched off. If it is not so, switch the machine off and comply with safety rules for isolation from power supply sources.

8.3.2.2. Inspection

CAUTION!

When operated, some machine parts feature high–temperature components and surfaces.
The operator MUST AVOID to approach them without wearing suitable protective garments.

Off–line check

If necessary, have access to the technical cabinet to check components every month. In particular:

1. Check that hydraulic pipes and pneumatic lines are not cracked or strained ; that they have no dripping, leaks or pressurized fluid jets;

2. Check warning, supply and control electric lines. They must not have non–insulated sections, cutting or coils with narrow radii of curvature;

3. Check internal sterilization chamber surfaces. They must be smooth, without any dents, abrasions or procks;

4. Check the magnetic fan, if any : the shaft blades must turn freely and without problems;

5. Check the paneling and cabinet external surfaces. Their form and painting must bee in good state;

6. Check the supply line and plant fittings. They must be fastened to the machine pipes, without cracks, deformations, dripping, leaks or pressurized fluid jets, especially on primary line shut–off valves, set by the user;

7. Check all plant components (solenoid valves, filters, sensors, electropneumatic actuators).
   The external containers must be in good state, the identification plates must be readable, the core hitches and tight connectors must be free from mechanical failures and/or isolation losses;

8. Check the integrity of heat probes. In particular, check the sensor head for scale, strain or breaks.
   The signal conductor sheath must bear bending, without cracks or isolation losses;

9. Check the autonomous generator, if any, and other auxiliary systems;

10. Start the emergency stop device several times (red mushroom–head button) to make sure that no failures and strange noise occur. The device form and color must be in good state;

11. Check the control devices (keyboard, display, pressure–vacuum gauges). Their surface must be free from cracks, abrasions and breaks. In particular, key and button serigraphs must be clearly readable, their colors in good state;

12. Check that all warning and danger plates are properly fitted and positioned on the machine surface and make sure that they are in good state, with unchanged colors.

On–line check

During any cycle or sterilization phase, access, if necessary, the technical cabinet every month to carry out the following check:

CAUTION!

When the machine is running, carry out VISUAL inspections only, using suitable personal protection means. Do not touch any machine parts.

1. Check that hydraulic pipes have no dripping, leaks or pressurized fluid jets;
2. Check that the machine is free from noise or failures deriving from pneumatic circuit leaks;
3. Check the primary supply line fittings. No dripping, leaks or pressurized fluid jets must be detected on primary line shut–off valves set by the user;
4. Check operating equipment noise (e.g. fan, vacuum pump, water pump, if any). It must not exceed usual levels, without intensity and/or tone changes.

8.3.3. Cleaning

CAUTION!

Before any cleaning operations, according to the instructions given in the previous section, carry out all steps explained in section 8.3.2.1. “Preliminary operations”.

WARNING

All parts in contact with process fluids in Fedegari sterilising machines are manufactured using austenitic stainless steel. When properly maintained, this material offers excellent corrosion resistance properties.

It is recommended to carry out maintenance cleaning of all internal surfaces at regular intervals. Unless otherwise provided, do not use abrasive tools or cloth. Always use soft natural or artificial sponges and rags without fraying.

CAUTION!

Austenitic stainless steel surfaces may lose their corrosion resistance properties and be irreversibly damaged if they come in contact with chlorine or chlorine compounds.
When operating and cleaning the steriliser, avoid the use of solutions and detergents containing chlorine or chlorides.

8.3.3.1. Cleaning the chamber

Ordinary cleaning

Wash and rinse the chamber every month.

1. Wash it with a solution of hot demineralized water and mild detergent for metals;
2. Carefully rinse it with water.

Cleaning surface dirt

Wash and rinse dirty chamber surfaces in order to clean them.

1. Wash them demineralized hot water and non–acid and non–abrasive detergents usually available on the market;
2. Carefully rinse with much water.

Cleaning dirt layers (oxide spots and rust)

If the chamber surface is encrusted or covered with dirt deposits with oxides, wash and rinse with slightly aggressive detergents for metals; in the presence of scale, use descaling solutions.

8.3.3.2. Cleaning the chamber filter

Make sure that the filter is clean every day. If necessary, clean it as follows:

1. Pull the filter body out of its housing by means of its grip;
2. Remove all macroscopic residues from the metal filter (glass pieces, organic fragments etc.);
3. Wash the filter with a solution of hot water and mild detergent for metals, using a soft horsehair or synthetic brush;
4. Carefully rinse it and, if necessary, dry the metal filter mesh with a low pressure compressed air jet (1.5 bar);
5. Fit the filter in its housing inside the chamber.

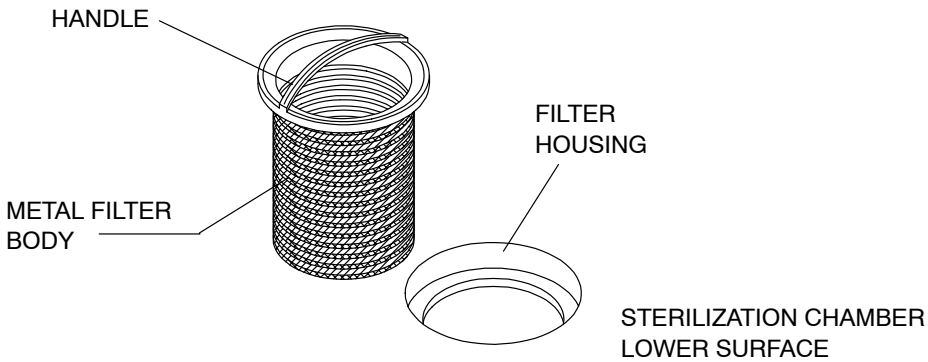


Figure 8.1 – Cleaning the chamber filter

WARNING

Do not pull out the filter if fragments, glass and other substances (e.g. agar etc.) are found on the chamber bottom..

Remove all solid substances and make sure that they do not fall in the drain trap during filter extraction, as they might clog and damage the sterilizer valves.

8.3.3.3. Cleaning the heat probe

Make sure every week that the heat probe is clean. If necessary, clean it as follows:

1. Take the heat probe out of the chamber and clean the sensor head with a solution of water and neutral detergent and a cotton cloth;
2. Use this solution and a non–abrasive sponge to clean the sheath. Dry the head and sheath using a clean cloth without fraying.

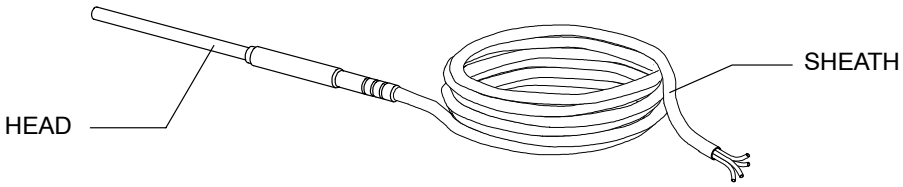


Figure 8.2 – Heat probe

8.3.3.4. Cleaning the operator interface devices

Clean these devices every week as follows:

Cleaning the operator interface and the pressure–vacuum gauges

1. With a vacuum cleaner, suck dirt on device reflective surfaces;
2. Clean the surface with a natural sponge soaked with clean water;
3. Dry surfaces with clean cotton cloth without breaking or a wet non–abrasive cloth.

8.3.3.5. Cleaning the cover and the external cabinet

Wash and rinse the cover and the external cabinet every month, with a wet cloth.

8.3.3.6. Cleaning the batch transport baskets

Wash and rinse the reservoirs every week to clean them.

1. Wash them with hot water and non–abrasive/non–acid detergents available on the market;
2. Carefully rinse them with water.

8.3.3.7. Cleaning line filters

Make sure every month that the line filters on the air, water and steam supply lines are clean.

8.3.4. Scheduled performance tests

8.3.4.1. Checking the chamber safety valves and the steam generator, if any

Check chamber safety valves and steam generator performance (if any) every month. The machine must be switched on and the process controller activated with a sterilization cycle in progress, with chamber under pressure at 1.5 bar.

To check performance:

1. During a sterilization cycle with chamber pressure higher than atmospheric pressure and lower than maximum operating pressure, unscrew the collar located on the top of the safety valve;
2. Soon after, check that steam is let out of safety valve drain gathering lines. Screw the collar again and make sure that the steam flow immediately stops.

NOTE

This check simply allows to verify that no gluing or deposits between the shutter and the valve housing prevent the operator from opening it, without ensuring that calibration is observed .

CAUTION!

The safety valves for pressurized reservoirs must be submitted to specific testing cycles, according to the rules in force in the country where the machine is used.
In time, gaskets may lose their seal. Check their correct operation periodically.

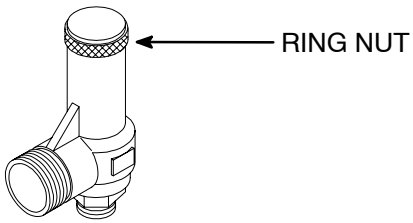


Figure 8.3 – Safety valve

8.3.4.2. Checking the chamber manual pressure relief valve

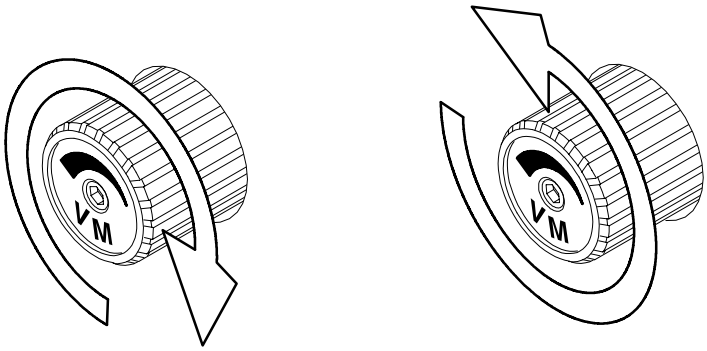
Carry out this check every day. The machine must be switched on and the process controller activated. Perform this test on completion of a ”CHAMBER VACUUM TEST” cycle.

NOTE

The valve is located on the sterilizer front paneling, near the emergency button.

1. During the “vacuum seal” or “pressure seal” phases, slightly open the valve and make sure that chamber pressure

is changing.



a. Valve closing **b.** Valve opening: drainage

Figure 8.4 – Chamber manual pressure relief valve

8.3.4.3. Checking chamber sealing (if vacuum pump is available)

WARNING
The sterilizer basic model, without vacuum pump and "pressure test", does not allow for chamber seal cycles.

This check, to be performed every week, allows to verify the chamber vacuum tightness. To carry out this procedure:

1. Start the machine and enable process controller; select option "SELECT PROGRAM" from the main menu. Select program "VACUUM TEST" on the page displayed;
2. Press key "START" F1 START to run the program;
3. Make sure that the test program is successfully executed and completed. Switch the machine off, unless further operations are required.

WARNING
If, during the test, the message "LEAK TEST ALARM" is displayed by the process control page, repair the failure, which is often due to dirty/faulty chamber loading/unloading valves or cover seal.

8.3.4.4. Checking chamber pressure (if pressurization with compressed air is available)

This check, to be performed every week, allows to verify the pressurized chamber tightness. To carry out this procedure:

1. Start the machine and enable process controller; select option “SELECT PROGRAM” from the main menu.
2. Select program “PRESSURE TEST” ;
3. Press key

to run the program;
4. Make sure that the test program is successfully executed and completed. Switch the machine off, unless further operations are required.

WARNING

If, during the test, the message “LEAK TEST ALARM” is displayed by the process control page, repair the failure, which is often due to dirty/faulty chamber loading/unloading valves or cover seal.

8.3.4.5. Checking the cover grommet

This check allows to verify the closing system performance and should be carried out every month.

Checking the seal

1. Follow the steps mentioned in section 8.3.2.1. “Preliminary operations”
2. Check the cover seal for wear and flexibility as follows:
   * Open the machine cover;
   * Check that the seal is not glued (e.g. due to improper use of chemicals for cleaning the machine);
   * Check that the seal is not broken or cracked;
   * Check that the seal body is free from metal particles and other materials (e.g. glass etc.).

8.3.4.6. Checking compressed air plant tightness

This check must be performed every month:

1. Close the sterilizer cover;
2. Close the compressed air supply outside the machine;
3. Check that the dedicated pressure gauge indicates that the plant pressure loss after a 1.5 h. shut–down is lower than 1.5/bar.

8.3.4.7. Checking heat probe (Pt100)

This check concerns the heat probe performance and should be carried out every week:

1. Check the heat probe state as follows:
   - Check that the heat probe enclosure has no holes and cuts;
   - Make sure that the sheath is not broken in the sealing point.
2. Check heat probe performance as follows:
   - Press key [3] to select option “AUTODIAGNOSE” from the main menu;
   - Press key [3] to select the page displaying the chamber Pressure and Temperature;
   - Bend the heat probe and check on the monitor that the temperature measured does not suddenly change.

8.3.4.8. Temperature check of the cover opening safety system

This check aims to verify the performance of the system which prevents the cover from opening when the chamber temperature is higher than a set value, corresponding to system parameter “FINAL TEMPERAT.”. This check can be performed only if system parameter “CHECK FINAL T” is set to 1.

To carry out this test:

- Close the cover;
- Set system parameter “CHECK FINAL T” to 1 ;
- Give system parameter ”FINAL TEMPERAT.” a value lower than the one measured by heat probe **T001** before closing the cover;
- Check that the cover does not open;
- Give system parameter ”FINAL TEMPERAT.” a value higher than the one measured by heat probe **T001** before closing the cover;
- Open the cover to make sure that it can be opened;

8.3.4.9. Checking the compressed air reducer (if the solenoid valve for compressed air inlet is available)

This check should be carried out every week to verify the compressed air reducer state. To carry out this check:

- Slightly turn the knob clockwise and anticlockwise;
- Check whether pressure is increasing or decreasing on the dedicated pressure gauge.

8.3.4.10. Calibrating the heat probe

1. Press key [3] to select option “AUTODIAGNOSE” from the main menu. The following menu will be displayed

(see Figure 8.5):

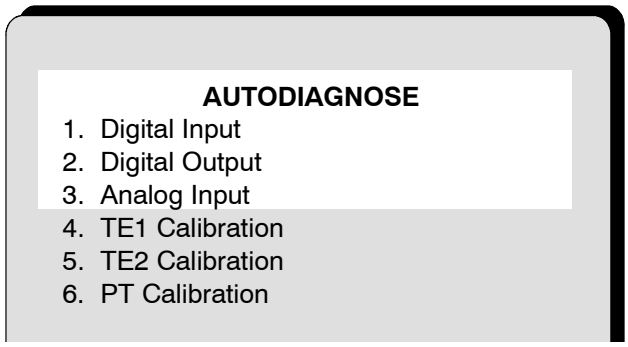


Figure 8.5 – Self–diagnosis menu

2. Press key [4] to display the calibration page for heat probe TE1 (T001) (see Figure 8.6).

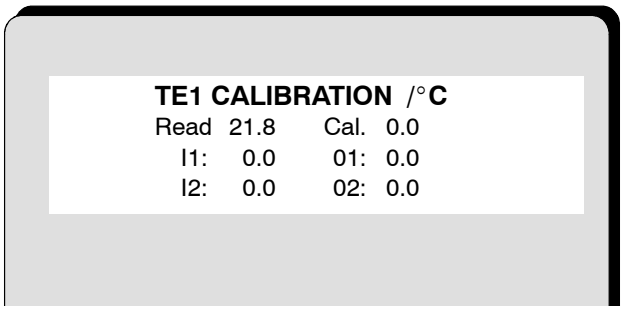


Figure 8.6 – TE1 calibration page

This page shows 4 numeric fields (I1, I2, O1, O2). Enter temperatures to set up the calibration table used by the process controller to correct the value measured in the sterilization chamber.

As results from the field names, the calibration table consists of the temperatures obtained through the identification of two calibration points, according to the following procedure:

* Take the heat probe out of the chamber and plunge it in a thermostatic bath, at a temperature of approx. 100°C;
* Wait until the heat probe is balanced, i.e. its temperature no longer changes;
* Enter the value displayed in field (I1) and enter the thermostatic bath temperature in field (O1) as follows (see Figure 8.7):

  a) Press [0 INS] to enter data;

  b) Use keys [→] and [←] to select the field;

  c) Type in the numeric value;

  d) Press key [ENTER] to store entered data.

* Repeat this procedure after having fixed the thermostatic bath temperature at a value of approx. 140°C and enter values in field I2 or O2 (see. 8.8).

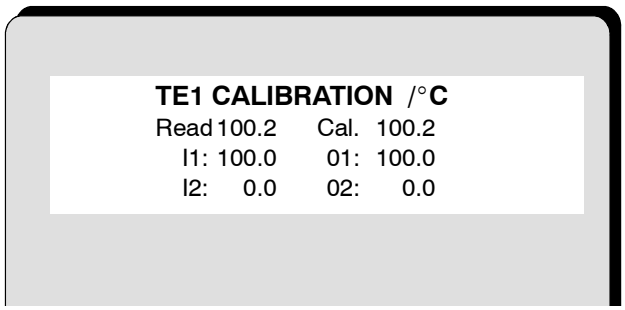


Figure 8.7 – Temperatures related to calibration low point

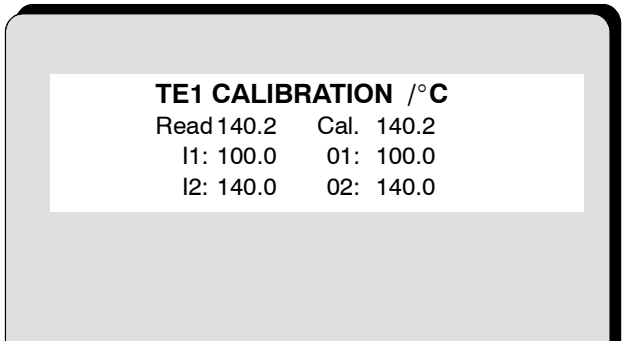


Figure 8.8 – Temperatures related to calibration high point

NOTE

Enter two different temperatures in fields I1 and I2. If such temperatures are the same (I1 = I2) a PLC error occurs (red LED lights up). To correct the error, change I1 or I2, switch off the sterilizer and switch it on again.

3. Press key [5] to access heat probe TE2 (T005) calibration page. Follow instructions of section 2.

If the above mentioned procedures do not allow to service failures mentioned in this paragraph, or in case of unexpected failures, it is strongly recommended to contact FEDEGARI's Service Centers.

8.3.4.11. Calibrating the pressure transducer

1. Press key [3] to select option "AUTODIAGNOSE" from the main menu. The following menu will be displayed

(see Figure 8.9):

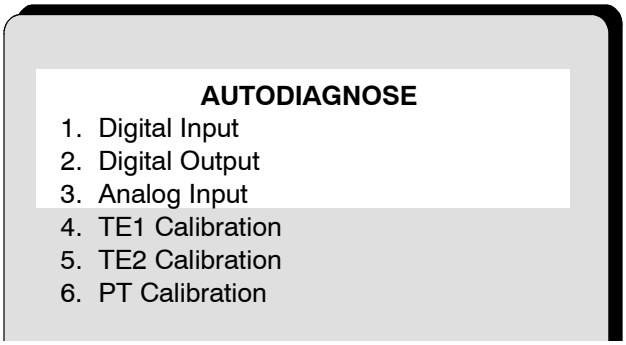


Figure 8.9 – Self–diagnosis menu

2. Press key [6] to access pressure transducer PT (P001) calibration page (see Figure 8.10).

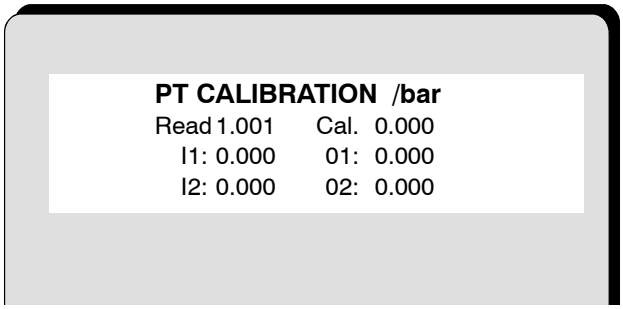


Figure 8.10 – PT calibration page

This page shows 4 numeric fields (I1, I2, O1, O2). Enter pressures to set up the calibration table used by the process controller to correct the value measured in the sterilization chamber.

As results from the field names, the calibration table consists of the pressures obtained through the identification of two calibration points, according to the following procedure:

* Connect the transducer to an environment with known and constant pressure, ranging from 0.01 to 6 bar.;

* Wait until the transducer is balanced, i.e. its pressure no longer changes;

* Enter the value displayed in field (I1) and enter calibration environment pressure in field (O1) as follows (see Figure 8.11:

  a) Press [0 INS] to enter data;

b) Use keys → and ← to select the field;

c) Type in the numeric value;

d) Press key ENTER to store entered data.

* For TP calibration high point, pressurize the transducer at a pressure ranging from 0.1 and 5 bar (e.g. 3 bar.); interface with a certified control instrument to obtain I2 and O2 (see 8.12).

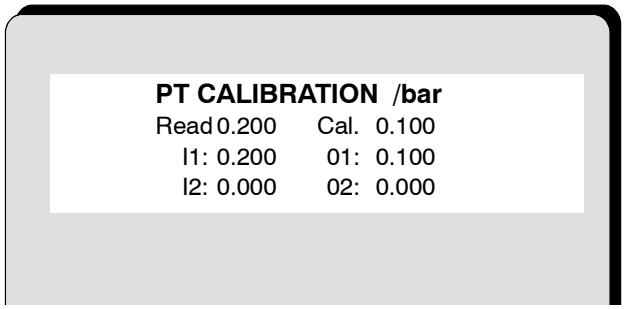


Figure 8.11 – Pressure related to calibration low point

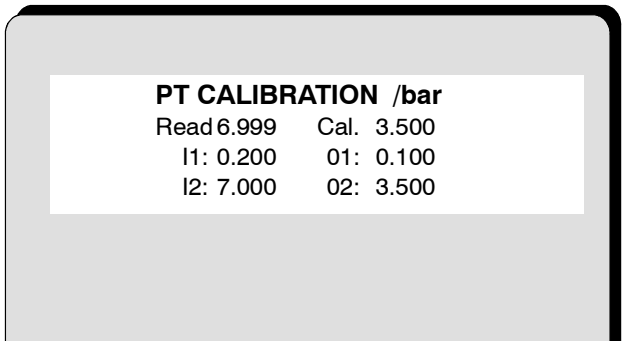


Figure 8.12 – Pressure related to calibration high point

CAUTION
The pressure transducer must be calibrated on the bench.

NOTE
Enter two different pressures in fields I1 and I2. If I1 = I2 a PLC error occurs. To correct the error, change I1 or I2, switch off the sterilizer and switch it on again.

If the above mentioned procedures do not allow to service failures mentioned in this paragraph, or in case of unexpected failures, it is strongly recommended to contact FEDEGARI's Service Centers.

8.3.4.12. Checking instruments with a control pressure gauge

This check allows to monitor the machine pressure gauges and pressure transducer. Connect a precision pressure gauge to the related connection provided on the sterilizer (see 8.13) or on the steam generator (see 8.14).

Measure pressure and vacuum, while comparing the control pressure gauge data to the data indicated by the machine instruments.

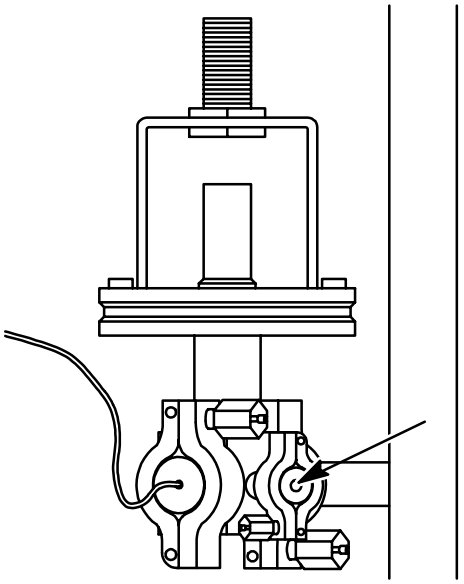


Figure 8.13 – Precision pressure gauge connected to the sterilizer

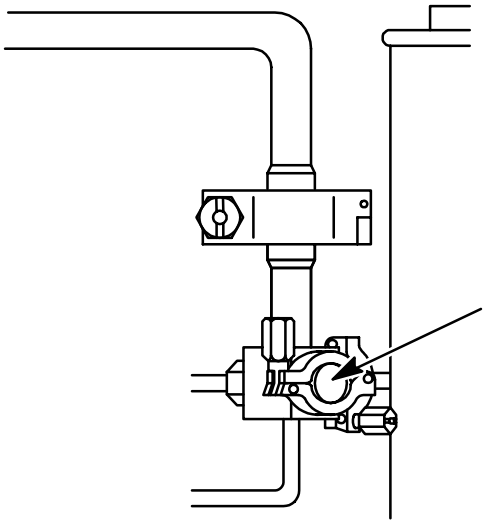


Figure 8.14 – Precision pressure gauge connected to the steam generator

8.3.4.13. Checking the chamber internal temperature with control sensors

The sterilizer can be fitted with control sensors through a suitable TT connection (see Figure 8.15). Fit the thermocouples or, if necessary, the heat probes, through this connection and place them in the chamber according to the temperature map to be carried out.

Carry out all measurements and recordings using the control instruments and performing the cycles to be monitored.

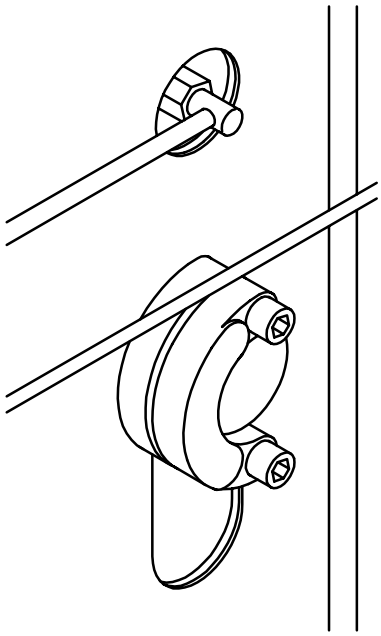


Figure 8.15 – Validation sensor connection

8.3.4.14. Checking print quality, paper amount and feed (if a printer is available)

Every day, before starting the machine:

1. Make sure that paper is available. To this end, check the paper roll. Printer paper must be properly aligned and the roll must have enough paper. The roll diameter must allow to complete a sterilization cycle printing. If paper is lacking, feed the printer with new paper, according to the following procedure, i.e. replace the old roll with a new one.
   - Open the printer cover;
   - Press the up–and–over support of the printing device (where the PUSH message is indicated);
   - Fit the paper edge in the feed slot;
   - Load the new roll;
   - Press the up–and–over support of the printing device (where the PUSH message is indicated);

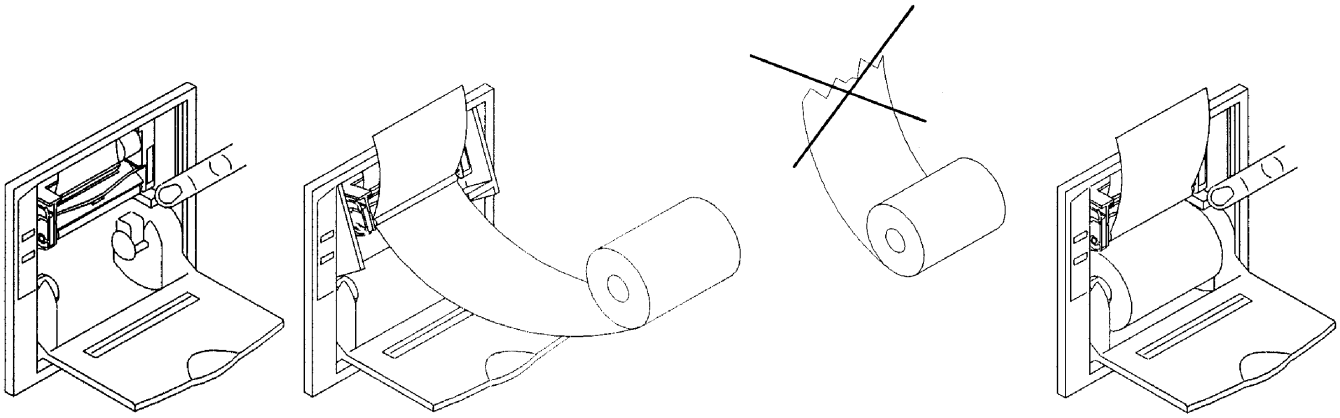


Figure 8.16– Replacing the paper roll

8.4. TROUBLESHOOTING

8.4.1. Replacing the operator panel battery

1. Switch the sterilizer off;
2. Remove the rear cover screw using a screw–driver;
3. Remove the rear cover, without damaging the flat cable connecting the serial interface module to the controller;
4. Remove the battery from its housing;
5. Install the new battery (3V lithium type DL2430 or equivalent);
6. Reassemble the rear cover and screw it (check that the flat cable is properly positioned);
7. Switch on the machine (check that the operator panel self–diagnosis page warns that the battery is charged).

8.4.2. Clearing paper jams (if a printer is available)

1. Open the printer cover;
2. Remove jammed paper from the feed slot;
3. Cut and remove jammed and damaged paper from the roll;
4. Fit the paper edge in the feed slot and press the paper feed button to make it protrude on the opposite side.

8.4.3. Replacing the sterile filter

1. Loosen the quick connection clamp connecting the compressed air unit to the chamber inlet unit;
2. Unscrew the filter of the two inlet and outlet fittings;
3. Screw the new filter to the fittings;
4. Fit the unit in the quick connection and tighten the clamp.

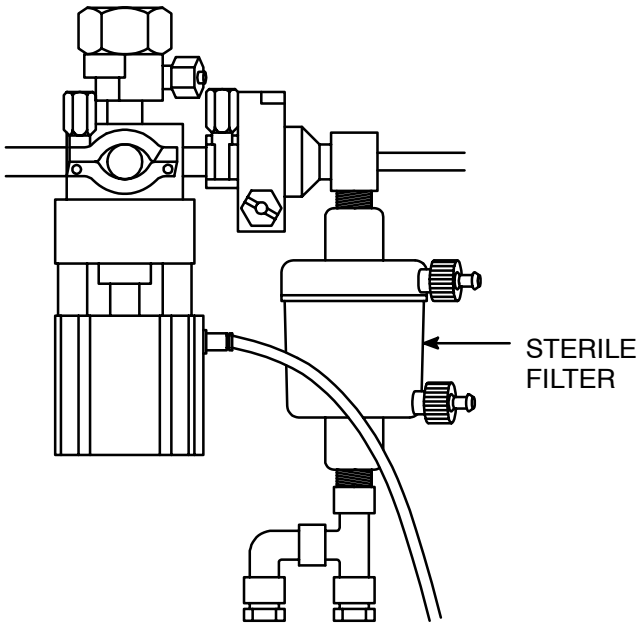


Figure 8.17 – Sterile filter

8.4.4. Replacing the PLC battery

When, the sterilizer being activated, the “ERR” led located on the PLC control card is lighted (see Figure 8.18) the PLC RAM battery might be discharged.

To replace it:

1. Switch the sterilizer off;
2. Power off the machine. Wait one minute, and replace the battery within three minutes;
3. Remove the upper screws of the rear cover of the console/electronic process controller;
4. Check that led “ERR” on the PLC control car is lighted;
5. With a flat screwdriver, lift the battery and take it out of the battery holder (see Figure 8.19);
6. Install the new battery (3V lithium type BR2032/CR2032/DL2032 or equivalent) in the battery holder, by sliding it on its side, with the positive face (+) facing upwards (see Figure 8.20);
7. Check that LED “RUN” is lighted;
8. Close the rear cover and screw it;
9. Turn on the sterilizer again.

NOTE

Before fitting a new battery, make sure that its surface is free from foreign matters.

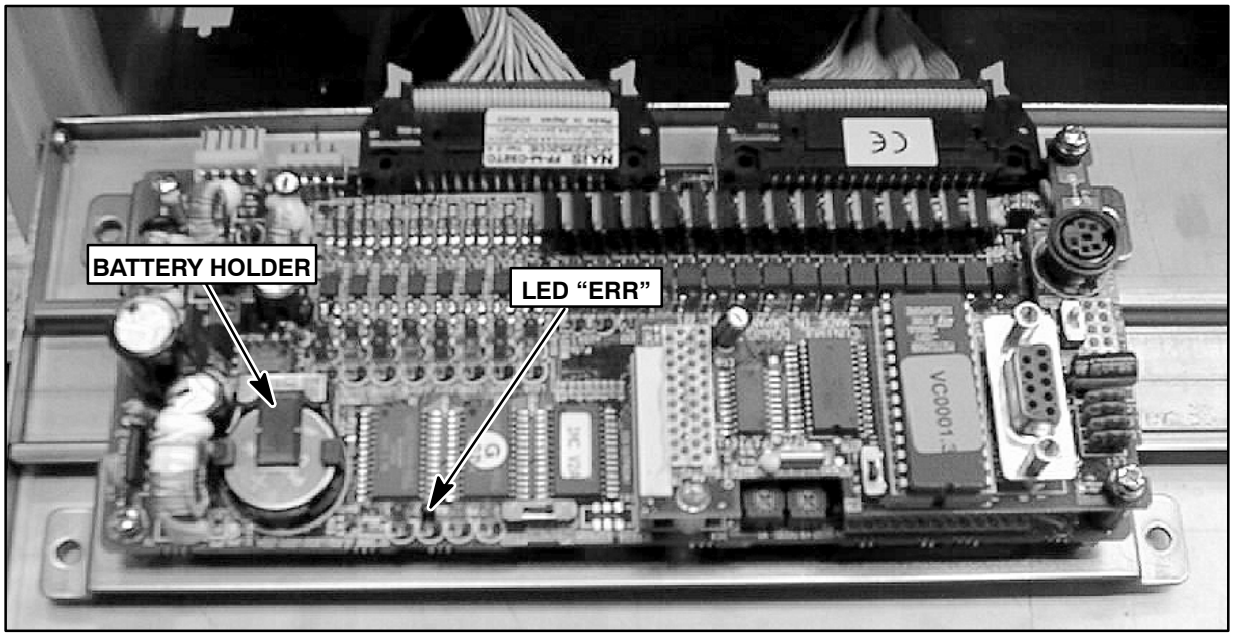


Figure 8.18 – Control card

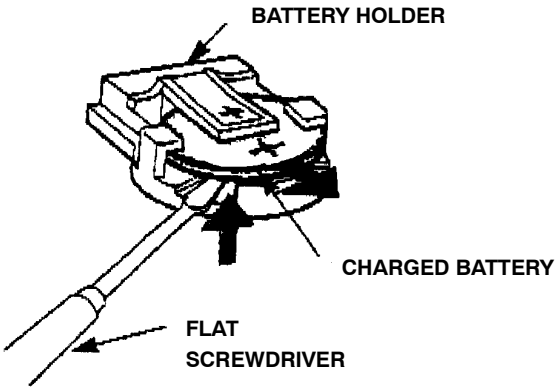


Figure 8.19 – Discharged battery removal

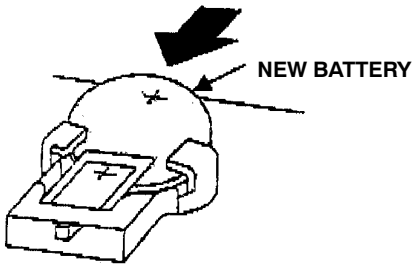


Figure 8.20 – Fitting a new battery

8.4.5. Replacing the power cable

To replace the power cable, proceed as follows:

1. Turn the steriliser off;

CAUTION

Before carrying out any maintenance operation, ALWAYS turn OFF the main power switch of the steriliser and disconnect the equipment from power supply network, except if otherwise specifically indicated.

NOTE

All cables used in the electrical board must be suitable to withstand a working temperature above 70°C.

2. Using a recessed head wrench (Allen), release the strain release clamp located on the bottom at the rear of the machine and free the cable;
3. Open the electrical board door;
4. Remove master switch from the relative guide (see Figure 8.21);
5. Remove the terminal board covers on the upper part of the master switch of the device;
6. Loosen the lugs and free the wires;
7. Loose the connection nut of the protection wire (PE) on the earth bar in the lower part of the electrical board and free and remove the cable;
8. Insert the new cable, and install it like the old cable;

ATTENZIONE!

Keep the lenght of the protection wire (PE) at least the double compared to the other wires. In this way it is possible to avoid, in case the protection wire is accidentally pulled, thet it is stressed before wires R–S–T–N.

9. Connect the protection wire to the (PE) lug on the earth bar and tighten the nut securely;
10. Tighten the power supply cables onto the terminal board of the power cut–out switch, ensuring that the phases and the neutral wires are connected to the correct positions **R–S–T–N** (see Figure 8.21);
11. Replace the terminal covers;
12. Insert master switch into the relative guide and close the electrical board;
13. Secure the cable in the strain relief clamp by tightening the nuts.

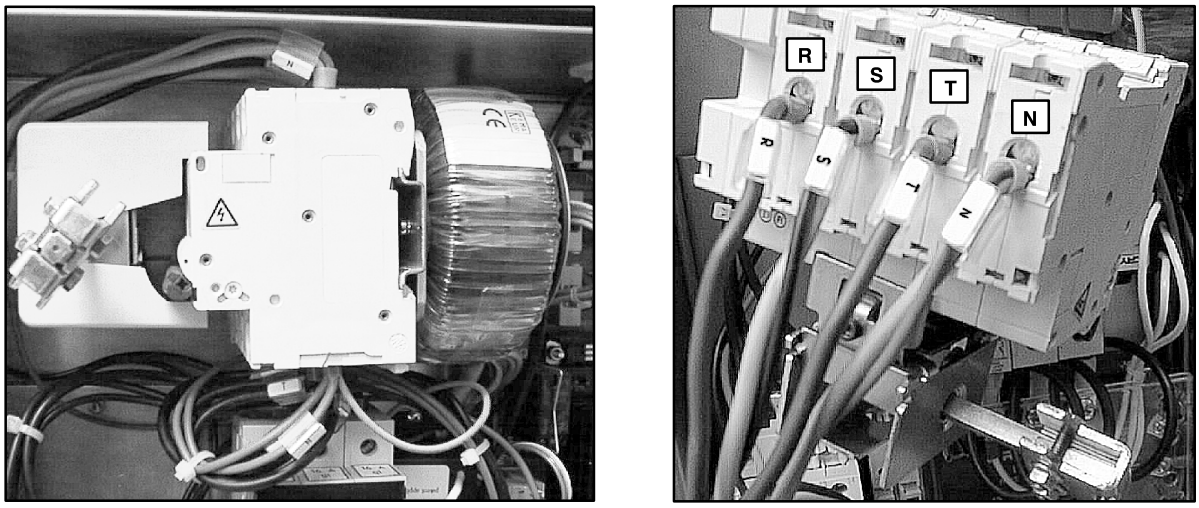


Figura 8.21 – Replacing the power cable: Power cut–out switch.

8.4.6. Replacing fuses

NOTE

The fuses positioned inside the electrical board must be replaced by a qualified personnel. The operator must not carry out this type of maintenance.

The electrical board's fuses are shown in Figure 8.22 while the relevant types, dimensions and quantities are indicated in Table 8.1.

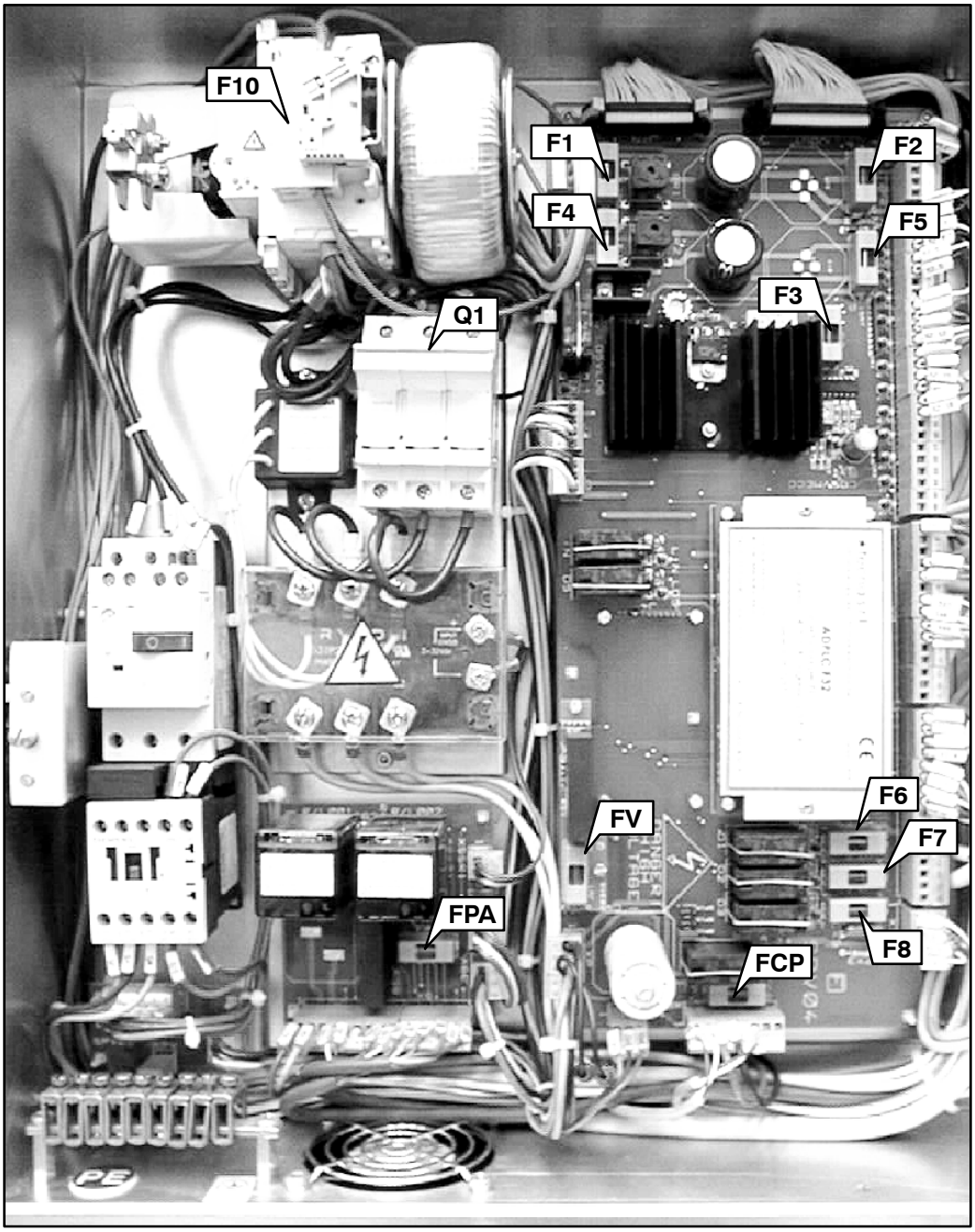


Figure 8.22 – Electrical board – fuses' arrangement

Table 8.1 – Fuses' identification

SYMBOL	A Ampere	TYPE	Q.TY
F1	3.15	T	1
F2	3.15	T	1
F3	3.15	T	1
F4	3.15	T	1
F5	3.15	T	1
F6	0.5	T	1
F7	0.5	T	1
F8	0.5	T	1
F10	1	T	2
FCP	2	T	1
FPA	2	T	1
FV	2	T	1
Q1	16	gl	3

To replace fuses, proceed as follows:

1. Turn off the sterilizer;

CAUTION!

Before carrying out any maintenance job on the sterilizer, ALWAYS TURN IT OFF, unless otherwise indicated, by switching off the master switch and disconnecting the equipment from the network supply.

2. Open the electrical board's door;
3. To access fuses **F1 – F2 – F3 – F4 – F5 – F6 – F7 – F8 – FCP – FPA – FV** open the cover of the relevant fuse–holder, as shown in Figure 8.23;
4. Remove the damaged fuse from its seat and replace it with a new fuse;
5. Re–close the fuse–holder cover.

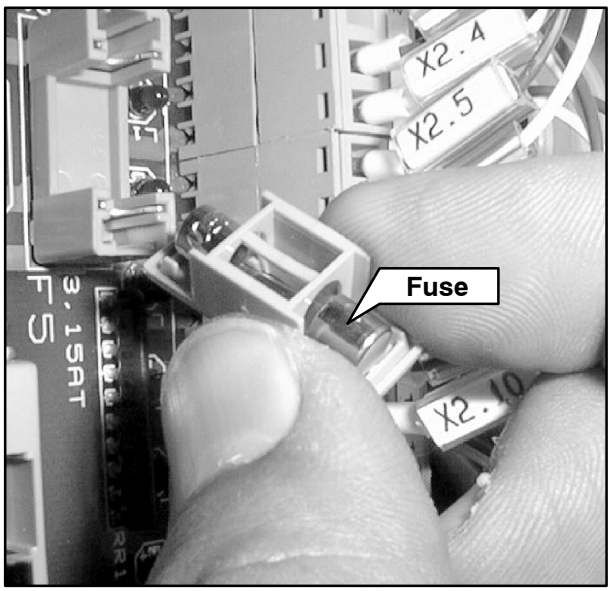


Figure 8.23 – Replacing fuses F1 – F2 – F3 – F4 – F5 – F6 – F7 – F8 – FCP – FPA – FV

6. To access fuses **F10** open the cover of the relevant fuse–holder, as shown in Figure 8.24;
7. Remove the damaged fuse from the relevant seat and replace it with a new one;
8. Re–close the fuse–holder cover.

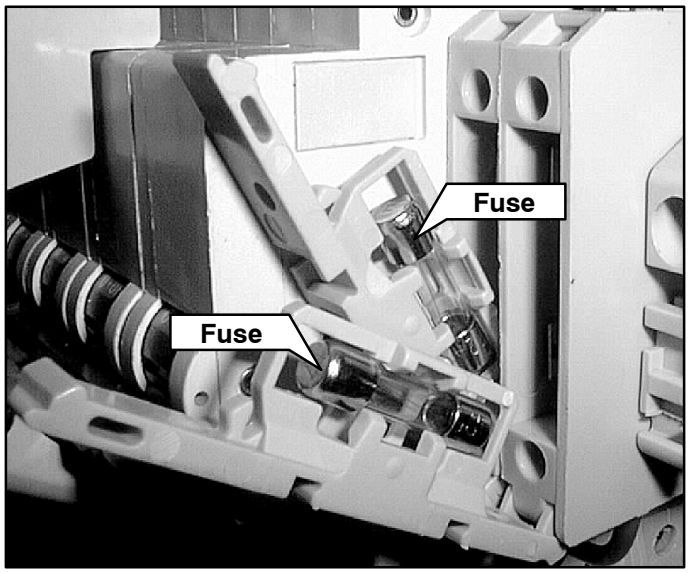


Figure 8.24 – Replacing fuses F10

9. To access fuses **Q1** open the cover of the relevant fuse–holder, as shown in Figure 8.25;
10. Remove the damaged fuse from the relevant seat and replace it with a new one;
11. Re–close the fuse–holder cover;

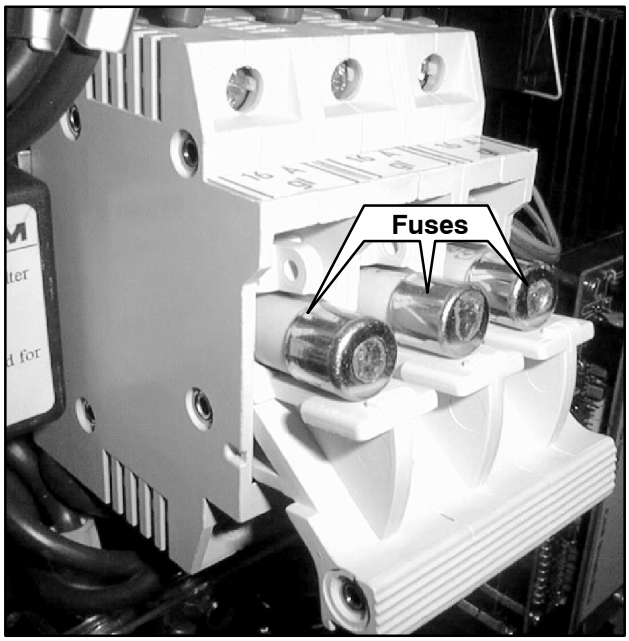
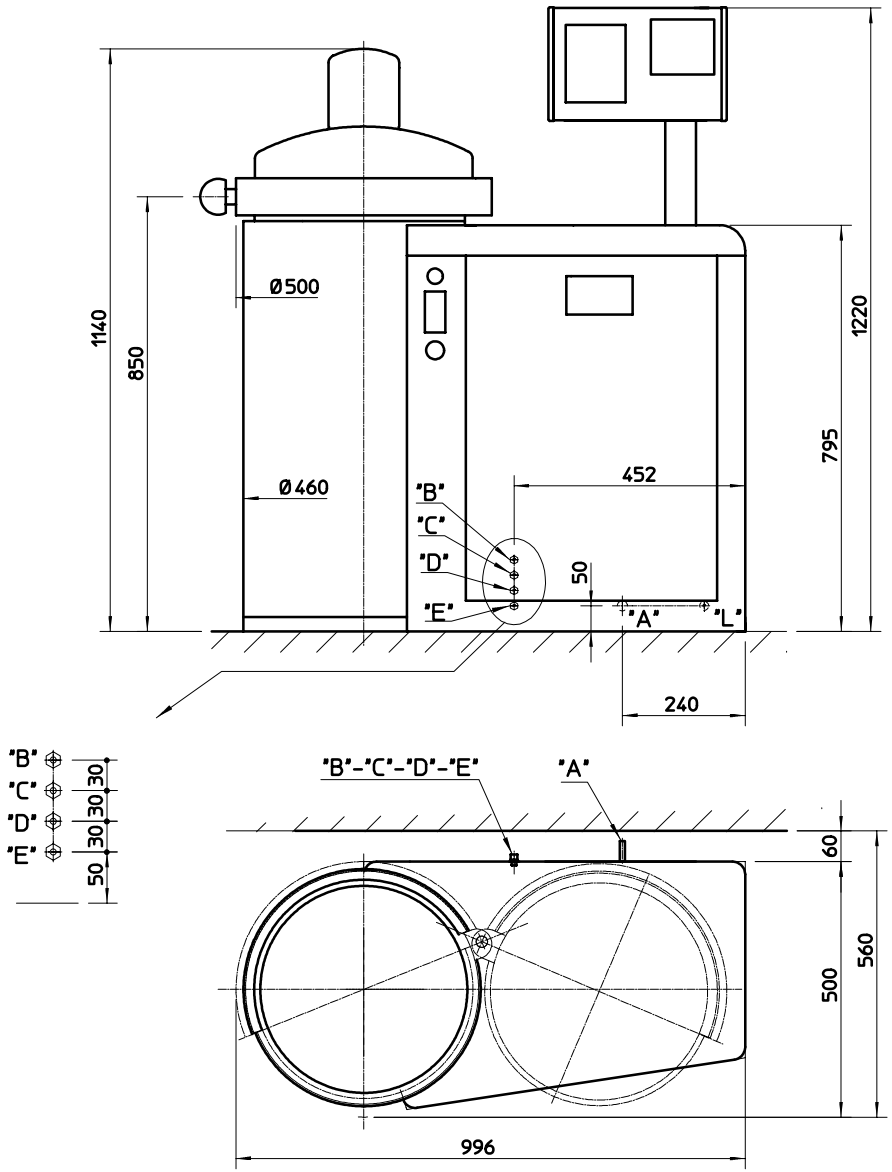


Figure 8.25 – Replacing fuses Q1

12. Close the electrical board.

ENCLOSURES

ENCLOSURES	MODEL		DOCUMENT No.	REVISION
Installation drawing	FVA2 FVA–HT		GA010391	4
	FVA3		GA010390	4
Piping & Instrumentation Diagram	FVA2 FVA3		GM010602	1
	FVA–HT		GM010800	0
P&ID legend	FVA2 FVA3		TD–65216	1
	FVA–HT		TD–65221	1
Wiring diagrams	FVA2 FVA3 FVA–HT	400V	GN010835	0
	FVA2 FVA3 FVA–HT	220V	GN010856	0



CAPACITA'CAMERA l=75
CHAMBER USEFUL VOLUME l=75

LA POSIZIONE DELLE CONNESSIONI E' INDICATIVA, ED INDICA L'AREA DOVE IL CLIENTE DOVRA' RENDERE DISPONIBILI I SERVIZI. UNA VOLTA POSIZIONATO LO STERILIZZATORE SARA' CURA DEL CLIENTE COLLEGARE I SERVIZI A CIASCUN SINGOLO PUNTO DI CONNESSIONE

POSITION OF CONNECTION IS INDICATIVE IN ORDER TO LET CUSTOMER DEFINE AREA WHERE UTILITIES SHOULD BE AVAILABLE ONCE STERILISATOR IS INSTALLED IT IS CUSTOMER DUTY TO CONNECT UTILITIES PIPINGS TO EACH SPECIFIC EQUIPMENT INSIDE THE STERILIZER

ALLACCIAMENTO UTENZE — *UTILITIES HOOK-UP*

REF.	DESCRIZIONE *DESCRIPTION*	DIMENSIONE *DIMENSION [DN]*
"A"	SCARICO portagomma *DRAIN nipple for flex. pipe*	ø 18
"B"	ACQUA DI RETE raccordo a compressione *TAP WATER single ferrule compression*	ø 6/4
"C"	ACQUA DEMINERALIZZATA raccordo a compressione *D.I.WATER*	ø 6/4
"D"	ARIA COMPRESSA raccordo a compressione *COMPRESSED AIR single ferrule compression*	ø 6/4
"E"	VAPORE PULITO raccordo a compressione *SATURATED STEAM single ferrule compression*	ø 6/4
"L"	ALIMENTAZIONE ELETTRICA *ELECTRIC POWER*	

PESO INDICATIVO AUTOCLAVE VUOTA
EMPTY AUTOCLAVE APPROX. WEIGHT — 173 kg

TOLERANCES FOLLOWING ISO 8015
INDICATIONS FOR DIMENSIONS WITHOUT INDIVIDUAL TOLERANCE INDICATIONS ISO 2768-cH

Nominal dimensions (mm)									
0.5 to 3	3 to 6	6 to 30	30 to 120	120 to 400	400 to 1000	1000 to 2000	2000 to 4000
±0.2	±0.3	±0.5	±0.8	±1.2	± 2	± 3	± 4

REV.	DATE	DES.	CHK.	REVISION DESCRIPTION
04	26-02-99	VIS	VIS	AGGIORNATO DISEGNO
03	1-02-99	FGA	FRL	MODIFICATO UTENZE
02	30-06-97	FGA	DOZ	AGGIORNATO DIMENSIONI
01	13-05-97	FGA	DOZ	MODIFICATO UTENZE

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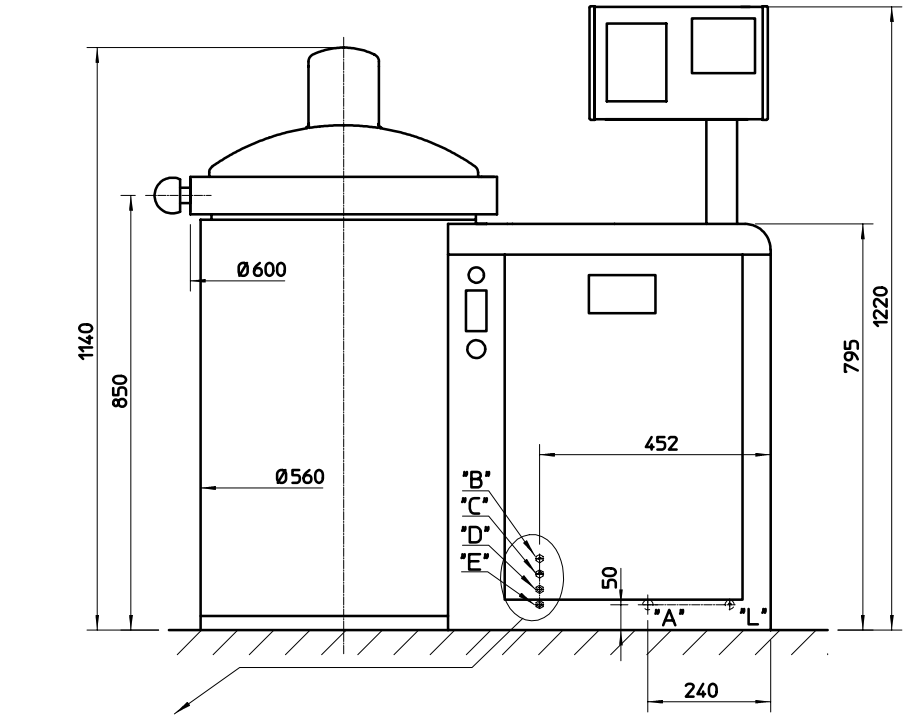
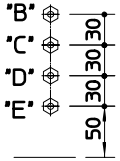
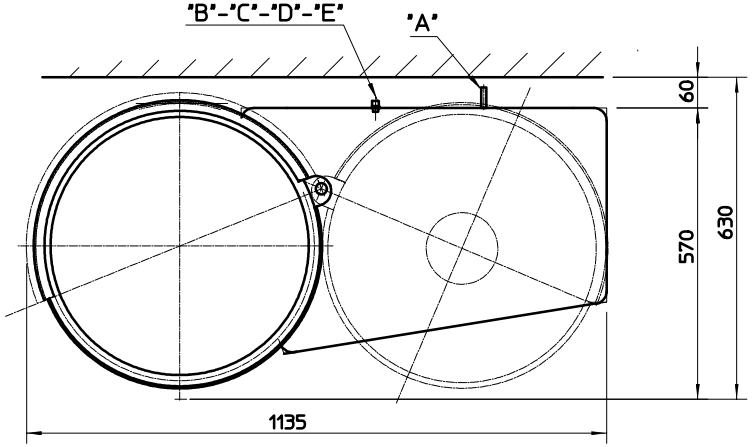
MACHINE **FVA2**	Material	Scale *****	FEDEGARI AUTOCLAVI SPA
GROUP **LAY OUT**	Status	Date (dd/mm/yy) **14-4-97**	
DESCRIPTION **INSTALLATION DRAWING**	Treatments	Des. **FGA**	DWG. NO. **GA 01 0391**
	Material code	Chk **FRL**	

Classe di appartenenza : disegno_install







CAPACITA'CAMERA l=140
CHAMBER USEFUL VOLUME l=140

LA POSIZIONE DELLE CONNESSIONI E' INDICATIVA, ED INDICA L'AREA DOVE IL CLIENTE DOVRA' RENDERE DISPONIBILI I SERVIZI. UNA VOLTA POSIZIONATO LO STERILIZZATORE SARA' CURA DEL CLIENTE COLLEGARE I SERVIZI A CIASCUN SINGOLO PUNTO DI CONNESSIONE

POSITION OF CONNECTION IS INDICATIVE IN ORDER TO LET CUSTOMER DEFINE AREA WHERE UTILITIES SHOULD BE AVAILABLE ONCE STERILISATOR IS INSTALLED IT IS CUSTOMER DUTY TO CONNECT UTILITIES PIPINGS TO EACH SPECIFIC EQUIPMENT INSIDE THE STERILIZER

ALLACCIAMENTO UTENZE — *UTILITIES HOOK-UP*

REF.	DESCRIZIONE *DESCRIPTION*	DIMENSIONE *DIMENSION [DN]*
"A"	SCARICO portagomma *DRAIN nipple for flex. pipe*	ø 18
"B"	ACQUA DI RETE raccordo a compressione *TAP WATER single ferrule compression*	ø 6/4
"C"	ACQUA DEMINERALIZZATA raccordo a compressione *D.I.WATER*	ø 6/4
"D"	ARIA COMPRESSA raccordo a compressione *COMPRESSED AIR single ferrule compression*	ø 6/4
"E"	VAPORE PULITO raccordo a compressione *SATURATED STEAM single ferrule compression*	ø 6/4
"L"	ALIMENTAZIONE ELETTRICA *ELECTRIC POWER*	

PESO INDICATIVO AUTOCLAVE VUOTA
EMPTY AUTOCLAVE APPROX. WEIGHT — 188 kg

TOLERANCES FOLLOWING ISO 8015
INDICATIONS FOR DIMENSIONS WITHOUT INDIVIDUAL TOLERANCE INDICATIONS ISO 2768-cH

Nominal dimensions (mm)								
0.5 to 3	3 to 6	6 to 30	30 to 120	120 to 400	400 to 1000	1000 to 2000	2000 to 4000
±0.2	±0.3	±0.5	±0.8	±1.2	± 2	± 3	± 4

REV.	DATE	DES.	CHK.	REVISION DESCRIPTION
04	26-02-99	VIS	VIS	AGGIORNATO DISEGNO
03	1-02-99	FGA	FRL	MODIFICATO UTENZE
02	30-06-97	FGA	DOZ	AGGIORNATO DIMENSIONI
01	13-05-97	FGA	DOZ	MODIFICATO UTENZE

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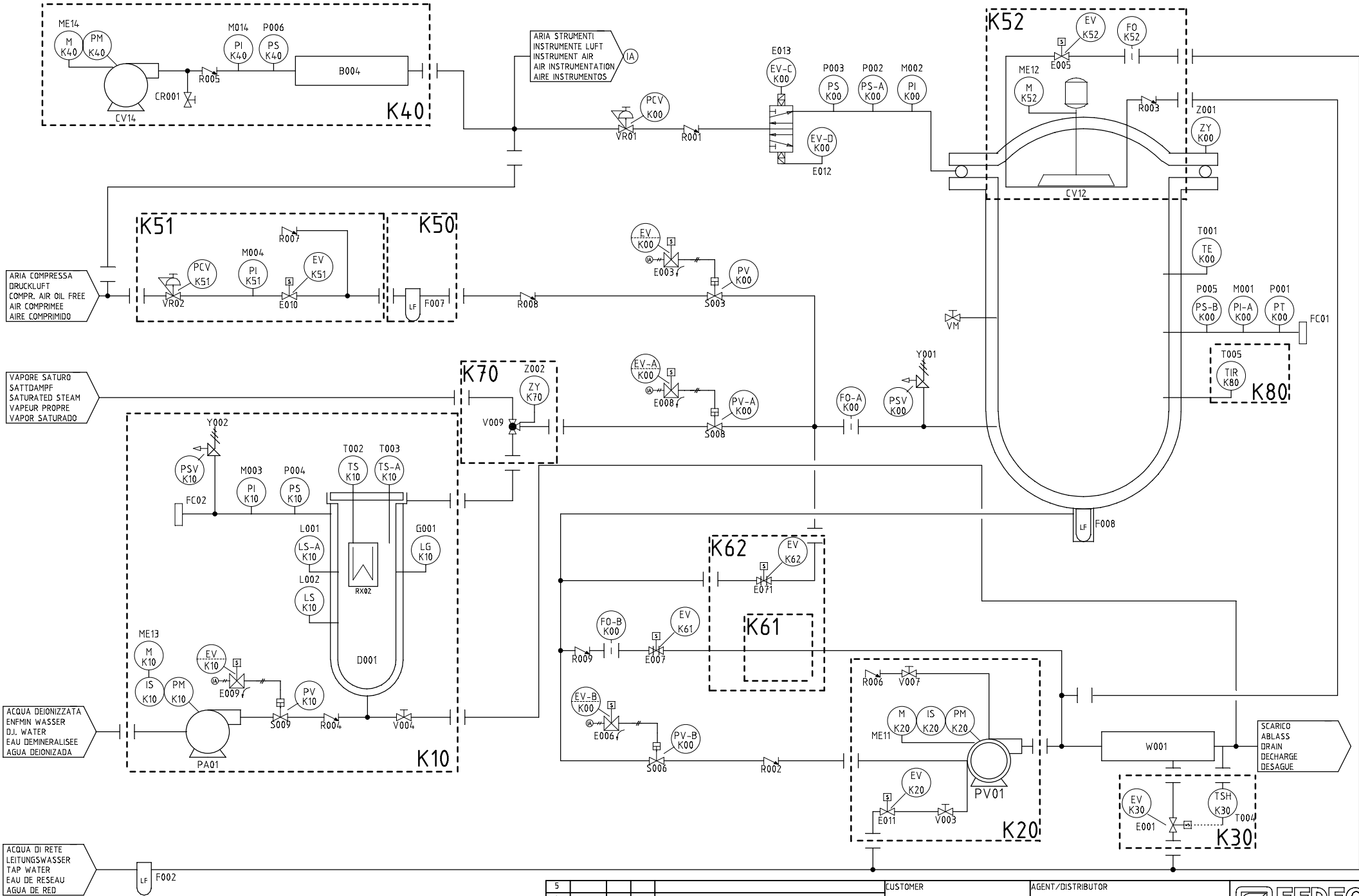
MACHINE **FVA3**	Material	Scale *****	FEDEGARI AUTOCLAVI SPA
GROUP **LAY OUT**	Status	Date (dd/mm/yy) **14-4-97**	
DESCRIPTION **INSTALLATION DRAWING**	Treatments	Des. **FGA**	DWG. NO. **GA 01 0390**
	Material code	Chk **FRL**	

Classe di appartenenza : disegno_install



Rev.	Date	Des.	Chk	Revision Description
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4				
3				
2				
1	10/01/01	ROS	FAF	TOLTO E007 DA K61
0	06/03/00	ROS	ROV	ANNULLA E SOSTITUISCE GM010087 REV.22

CUSTOMER

AGENT/DISTRIBUTOR

MACHINE: FVA2-3

DESCRIPTION: P&ID

NF: FVA

Date: 10.01.2001

Des.: ROS

Chk: PAF

FEDEGARI AUTOCLAVI SPA

DWG NUMBER: GM010602

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Name	Function	Description	Acceptance Test By *	Code	Spare Parts Kit
	BASIC MACHINE				
E003	Solenoid Valve Comm. S003	Solenoid Valve		CJ000017	
E006	Solenoid Valve Comm. S006	Solenoid Valve		CJ000017	
E008	Solenoid Valve Comm. S008	Solenoid Valve		CJ000017	
E012	Solenoid Valve Gasket Fill	Solenoid Valve		CJ000015	
E013	Solenoid Valve Gasket Fill	Solenoid Valve		CJ000015	
F002	Tap Water Filter	Filter		CC120062	
F008	Drain Filter	Filter		GM300184	CC050035
FC01	Control Flange	Flange		GM100605	CC050106
M001	Chamber Pressure	Manovacuumeter		CH010032	CC050120
M002	Gasket Pressure	Manometer		CH010039	
P001	Chamber Pressure	Pressure Transduc.		CD230025	CC050115
P002	Max.Gasket Pressure	Pressure Switch		CD240004	CC050013
P003	Min.Gasket Pressure	Pressure Switch		CD240005	CC050013
P005	Chamber Min.Pressure	Pressure Switch Proximity	A-A1-E-F-F1-H	GM250329	PP600240 CD200007
P005	Chamber Min.Pressure	Pressure Switch Micro	B-C-D	GM250305	PP600240 CD200026
R001	Non-Return Gasket Valve Air Line	Non-Return Valve		CJ080010	
R002	Non-Return Valve On Drain Line	Non-Return Valve		GM350125	KK000092
R008	Non-Return Valve On Air Line	Non-Return Valve		GM350125	KK000092
R009	Non-Return Valve On Drain Line	Non-Return Valve		GM350125	KK000092
S003	Chamber Air Charge	Pneumatic Valve		GM200089	KM150007
S006	Drain	Pneumatic Valve		GM200091	KM150013
S008	Chamber Steam Inlet	Pneumatic Valve		GM200089	KM150007
T001	Chamber Temperature	Pt100 Flexible		PM600045	KK000111
VM	Chamber Pressure Drain	Manual Valve		GM150008	KM150013
VR01	Gasket Air Reducer	Air Reducer Filter		CC120034	
Z001	Cover Lock	Microswitch		CD200033	
Y001	Overpressure Chamber	Safety Valve	A-A1	CJ060162	CC050083
Y001	Overpressure Chamber	Safety Valve	E-B-C-D	CJ060012	CC050092
Y001	Overpressure Chamber	Safety Valve	F-F1-H		

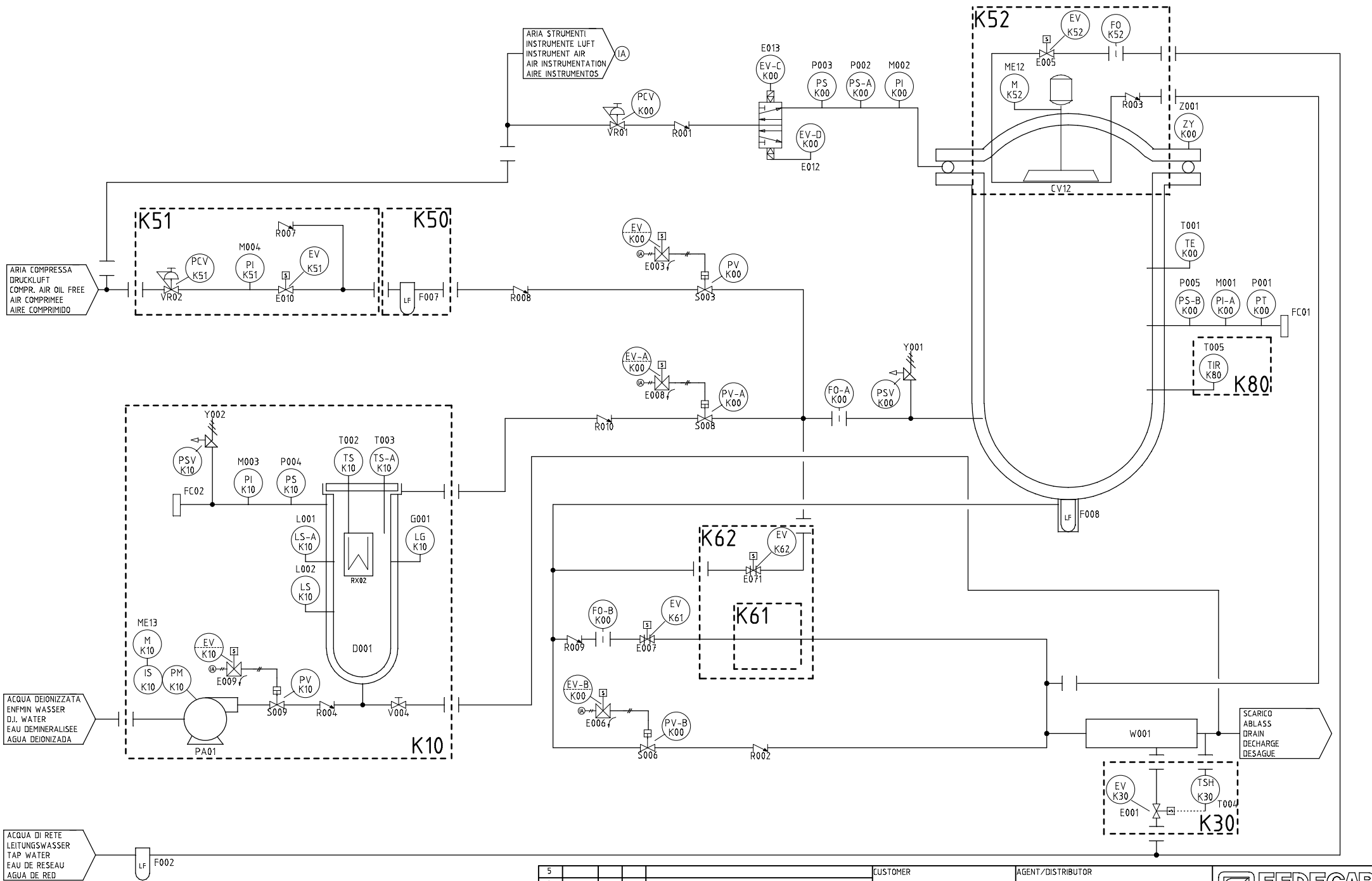
Name	Function	Description	Acceptance Test By *	Code	Spare Parts Kit
K10	***STEAM GENERATOR***				
E009	Solenoid Valve Comm. S009	Solenoid Valve		CJ000017	
FC02	Control Flange	Flange	A-A1-B-C-E-H	PM101347	CC050106
FC02	Control Flange	Flange	D-F-F1	PM101568	CC050106
G001	Visual Level	Tempered Disc		CB090003	CC050005
L001	Steam Generator Max. Level	Electronic Level		CE050002	
		Level Feeder		CE050001	
		Level Probe		GM700077	KK000080
L002	Steam Generator Min. Level	Electronic Level		CE050002	
		Level Feeder		CE050001	
		Level Probe		GM700077	KK000080
M003	Steam Generator Pressure	Manometer		CH010032	CC050120
P004	Steam Gener. Press. Control	Pressure Switch		CD240019	CC050120
PA01	Water Charge	Motorpump	A-A1-B-C-D-E	CF030135	
PA01	Water Charge	Motorpump	F	CF030154	
PA01	Water Charge	Motorpump	F1	CF030155	
PA01	Water Charge	Motorpump	H	CF030156	
R004	Non-Return Valve	Non-Return Valve		GM350125	KK000092
RX02	Heating Elements	Electric Elements	A-A1-B-C-D-E	GM550024	CC050028
RX02	Heating Elements	Electric Elements	F	GM550042	CC050028
RX02	Heating Elements	Electric Elements	F1	GM550052	CC050028
RX02	Heating Elements	Electric Elements	H	GM550070	CC050028
S009	Water Charge	Pneumatic Valve		GM200089	KM150007
T002	Heating Elem. Protection	Thermostat	A-A1-B-C-D-E-H	CD220009	
T002	Heating Elem. Protection	Thermostat	F-F1		
T003	Temperature Control	Thermostat	B-C-D	CD220008	
T003	Temperature Control	Thermostat	F-F1		
V004	Generator Drain	Manual Valve	A-A1-B-C-D-E-H	GM150024	KM150013
V004	Generator Drain	Manual Valve	F-F1	GM150057	
Y002	Generator Overpressure	Safety Valve	A-A1	CJ060163	CC050083
Y002	Generator Overpressure	Safety Valve	E-B-C-D	CJ060025	CC050092
Y002	Generator Overpressure	Safety Valve	F-F1-H		
K20	***VACUUM PUMP***				
E011	Liquid Ring Water	Water Solen. Valve		CJ000060	
PV01	Chamber Vacuum	Vacuum Pump	A-A1-B-C-D-E	CF030048	
PV01	Chamber Vacuum	Vacuum Pump	F-F1	CF030070	
PV01	Chamber Vacuum	Vacuum Pump	H	CF030076	
R006	Non-Return Air	Non-Return Valve		CJ080010	
V003	Water Flow Control	Pin Valve		CB100001	
V007	Air Flow Control	Flow Control		CB100015	

Name	Function	Description	Acceptance Test By *	Code	Spare Parts Kit
K30	***DRAIN COOLING SYSTEM***				
E001	Cooling Water	Water Solen. Valve		CJ000060	
T004	Drain Temperature Regulation	Thermostat		CD220007	
K40	***ELECTRIC AIR COMPRESSOR***				
B001	Air Storage Tank	Tank			
CV14	Air Compressor	Membrane	A-A1-B-C-D-E	CF040003	
CV14	Air Compressor	Membrane	F	CF040007	
CV14	Air Compressor	Membrane	F1	CF040006	
CV14	Air Compressor	Membrane	H	CF040010	
P006	Pressure Regulation	Pressure Switch		CD240042	
R005	Non-Return Air	Non-Return Valve		CJ080010	
M014	Air Compressor Pressure	Manometer		CH010039	
CR001	Compressor Vent	Flow Control		CB020137	
K50	***AIR STERILIZING FILTER***				
F007	Atmospheric Press. Balance	Filter		CC120035	
K51	***MAIN COMPRESSED AIR SUPPLY ASSEMBLY***				
E010	Compressed Air Inlet	Solenoin Valve		CJ000060	
M004	Air Pressure	Manometer		CH010039	
R007	Non-Return Air	Non-Return Valve		CJ080003	
VR02	Pressure Reduction	Air Reducer		CJ050013	
K52	***QUICK COOLING ASSEMBLY***				
E005	Cooling Water	Water Solen. Valve		CJ000060	
ME12	Fan Motor	Motor	A-A1-B-C-D-E-F-F1	CF000093	
ME12	Fan Motor	Motor	H	CF000110	
R003	Non-Return Water	Non-Return Valve		CJ080010	
K61	***CHAMBER PRESSURE TIGHTNESS TEST***				
E007	Pressure Test With Control	Solenoid V. Steam		CJ000054	

Name	Function	Description	Acceptance Test By *	Code	Spare Parts Kit
K62	***DECONTAMINATION CYCLE***				
E071	Steam Charge With Control	Solenoid V. Steam		CJ000054	
K70	***STEAM SUPPLY SELECTOR***				
V009	Steam Line Deviation	3 Way Manual Valve		CJ070029	
Z002	Steam Charge With Control	Microswitch		CD200005	
K80	***ADDITIONAL HEAT PROBE***				
T005	Optional Probe	Pt100 Flexible		PM600045	KK000111
K81	***PROCESS PRINTER***				
-	Printer	Thermal printer		CE020017	
K82	***Kit EN285***				
-	Datalogger	Printer/recorder		CE020021	

*

A	ISPESL 400 V 50 Hz	C	ASIT 400 V 50 Hz	F	ASME 460/480 V 60 Hz
A1	ISPESL 220 V 50 Hz	D	TUEV/A 400 V 50 Hz	F1	ASME 220 V 60 Hz
B	TUEV/D 400 V 50 Hz	E	APAVE 400 V 50 Hz	H	MOL 200 V 60 Hz



Rev.	Date	Des.	Chk	Revision Description
5				
4				
3				
2				
1				
0				

CUSTOMER

AGENT/DISTRIBUTOR

FEDEGARI AUTOCLAVI SPA

MACHINE: FVA-HT

NF: FVA

Des.: ROS

DWG NUMBER: GM010800

DESCRIPTION: P&ID

Date: 24/05/2001

Chk: FAF

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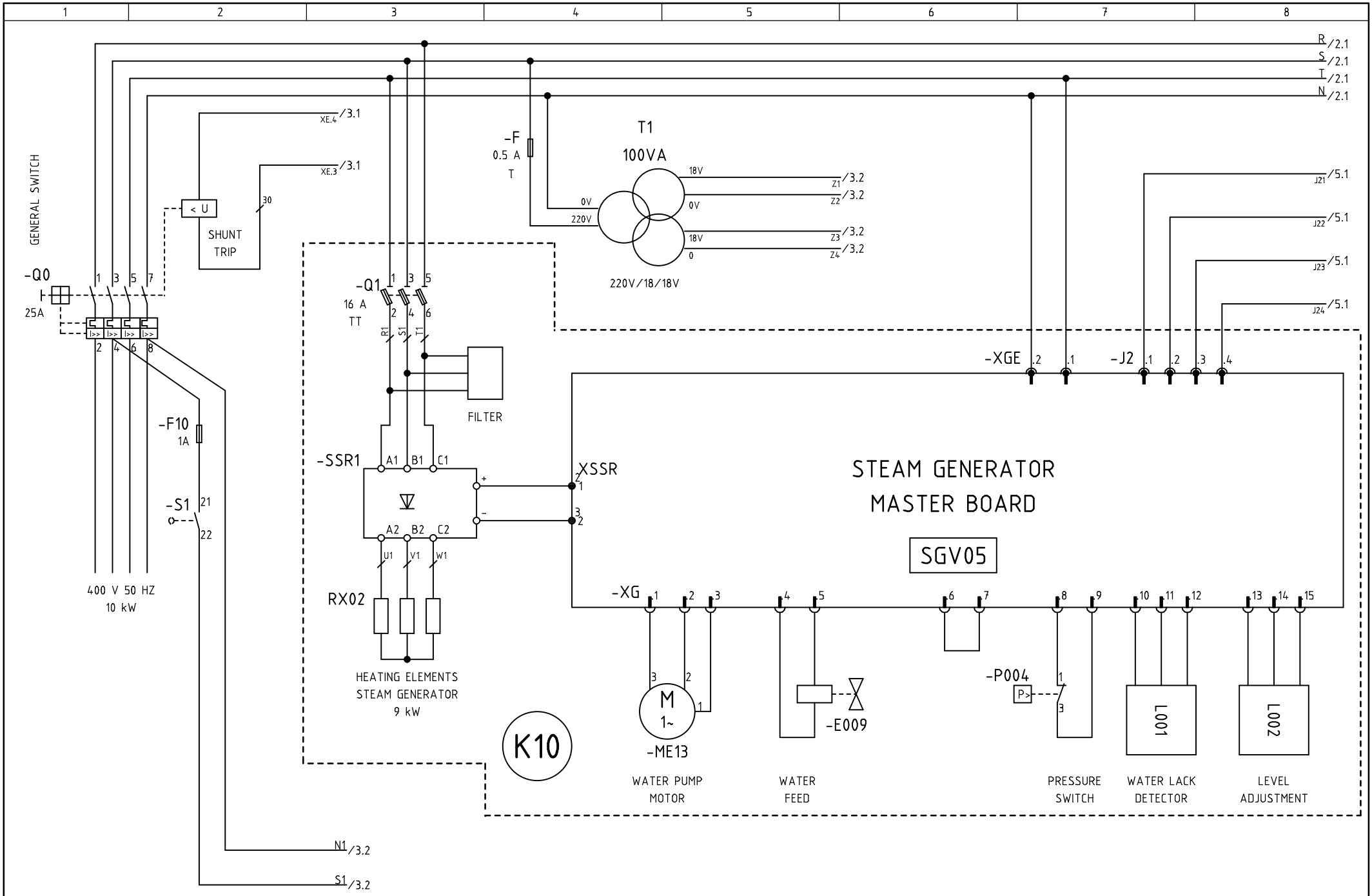
Name	Function	Description	Acceptance Test By *	Code	Spare Parts Kit
	BASIC MACHINE				
E003	Solenoid Valve Comm. S003	Solenoid Valve		CJ000017	
E006	Solenoid Valve Comm. S006	Solenoid Valve		CJ000017	
E007	Solenoid Valve Comm. S007	Solenoid Valve		CJ000054	
E008	Solenoid Valve Comm. S008	Solenoid Valve		CJ000017	
E012	Solenoid Valve Gasket Fill	Solenoid Valve		CJ000077	
E013	Solenoid Valve Gasket Fill	Solenoid Valve		CJ000077	
F002	Tap Water Filter	Filter		CC120062	
F008	Drain Filter	Filter		GM300184	CC050035
FC01	Control Flange	Flange		GM100605	CC050106
M001	Chamber Pressure	Manovacuumeter		CH010045	CC050120
M002	Gasket Pressure	Manometer		CH010039	
P001	Chamber Pressure	Pressure Transduc.		CD230030	CC050115
P002	Max.Gasket Pressure	Pressure Switch		CD240049	CC050013
P003	Min.Gasket Pressure	Pressure Switch		CD240005	CC050013
P005	Chamber Min.Pressure	Pressure Switch Proximity	A-A1-E-F-F1-H	GM250329	PP600240 CD200007
P005	Chamber Min.Pressure	Pressure Switch Micro	B-C-D	GM250305	PP600240 CD200026
R001	Non-Return Gasket Valve Air Line	Non-Return Valve		CJ080010	
R002	Non-Return Valve On Drain Line	Non-Return Valve		GM350125	KK000092
R008	Non-Return Valve On Air Line	Non-Return Valve		GM350125	KK000092
R009	Non-Return Valve On Drain Line	Non-Return Valve		GM350125	KK000092
R010	Non-Return Valve On Steam Line	Non-Return Valve		GM350125	KK000092
S003	Chamber Air Charge	Pneumatic Valve		GM200089	KM150007
S006	Drain	Pneumatic Valve		GM200091	KM150013
S008	Chamber Steam Inlet	Pneumatic Valve		GM200338	KM150007
T001	Chamber Temperature	Pt100 Flexible		PM600045	KK000111
VR01	Gasket Air Reducer	Air Reducer Filter		CC120034	
Z001	Cover Lock	Microswitch		CD200033	
Y001	Overpressure Chamber	Safety Valve	A-A1	CJ060274	CC050083
Y001	Overpressure Chamber	Safety Valve	E-B-C-D	CJ060272	CC050092
Y001	Overpressure Chamber	Safety Valve	F-F1-H		

Name	Function	Description	Acceptance Test By *	Code	Spare Parts Kit
K10	***STEAM GENERATOR***				
E009	Solenoid Valve Comm. S009	Solenoid Valve		CJ000017	
FC02	Control Flange	Flange	A-A1-B-C-E-H	PM101347	CC050106
FC02	Control Flange	Flange	D-F-F1	PM101568	CC050106
G001	Visual Level	Tempered Disc		CB090003	CC050005
L001	Steam Generator Max. Level	Electronic Level		CE050002	
		Level Feeder		CE050001	
		Level Probe		GM700077	KK000080
L002	Steam Generator Min. Level	Electronic Level		CE050002	
		Level Feeder		CE050001	
		Level Probe		GM700077	KK000080
M003	Steam Generator Pressure	Manometer		CH010045	CC050120
P004	Steam Gener. Press. Control	Pressure Switch		CD240019	CC050120
PA01	Water Charge	Motorpump	A-A1-B-C-D-E	CF030135	
PA01	Water Charge	Motorpump	F	CF030154	
PA01	Water Charge	Motorpump	F1	CF030155	
PA01	Water Charge	Motorpump	H	CF030156	
R004	Non-Return Valve	Non-Return Valve		GM350125	KK000092
RX02	Heating Elements	Electric Elements	A-A1-B-C-D-E	GM550024	CC050028
RX02	Heating Elements	Electric Elements	F	GM550042	CC050028
RX02	Heating Elements	Electric Elements	F1	GM550052	CC050028
RX02	Heating Elements	Electric Elements	H	GM550070	CC050028
S009	Water Charge	Pneumatic Valve		GM200089	KM150007
T002	Heating Elem. Protection	Thermostat	A-A1-B-C-D-E-H	CD220009	
T002	Heating Elem. Protection	Thermostat	F-F1		
T003	Temperature Control	Thermostat	B-C-D	CD220015	
T003	Temperature Control	Thermostat	F-F1		
V004	Generator Drain	Manual Valve	A-A1-B-C-D-E-H	GM150024	KM150013
V004	Generator Drain	Manual Valve	F-F1	GM150057	
Y002	Generator Overpressure	Safety Valve	A-A1	CJ060275	CC050083
Y002	Generator Overpressure	Safety Valve	E-B-C-D	CJ060273	CC050092
Y002	Generator Overpressure	Safety Valve	F-F1-H		

Name	Function	Description	Acceptance Test By *	Code	Spare Parts Kit
K30	***DRAIN COOLING SYSTEM***				
E001	Cooling Water	Water Solen. Valve		CJ000019	
T004	Drain Temperature Regulation	Thermostat		CD220007	
K50	***AIR STERILIZING FILTER***				
F007	Atmospheric Press. Balance	Filter		CC120035	
K51	***MAIN COMPRESSED AIR SUPPLY ASSEMBLY***				
E010	Compressed Air Inlet	Solenoin Valve		CJ000019	
M004	Air Pressure	Manometer		CH010039	
R007	Non-Return Air	Non-Return Valve		CJ080003	
VR02	Pressure Reduction	Air Reducer		CJ050013	
K52	***QUICK COOLING ASSEMBLY***				
E005	Cooling Water	Water Solen. Valve		CJ000019	
ME12	Fan Motor	Motor	A-A1-B-C-D-E-F-F1	CF000093	
ME12	Fan Motor	Motor	H	CF000110	
R003	Non-Return Water	Non-Return Valve		CJ080010	
K61	***CHAMBER PRESSURE TIGHTNESS TEST***				
E007	Pressure Test With Control	Solenoid V. Steam		CJ000054	
K62	***DECONTAMINATION CYCLE***				
E071	Steam Charge With Control	Solenoid V. Steam		CJ000054	
K80	***ADDITIONAL HEAT PROBE***				
T005	Optional Probe	Pt100 Flexible		PM600045	KK000111
K81	***PROCESS PRINTER***				
-	Printer	Thermal printer		CE020017	

*

A	ISPESL 400 V 50 Hz	C	ASIT 400 V 50 Hz	F	ASME 460/480 V 60 Hz
A1	ISPESL 220 V 50 Hz	D	TUEV/A 400 V 50 Hz	F1	ASME 220 V 60 Hz
B	TUEV/D 400 V 50 Hz	E	APAVE 400 V 50 Hz	H	MOL 200 V 60 Hz



REPRODUCTION FORBIDDEN

3			6			DATE	15.11.2000	
2			5			DES.	ROC	
1			4			CHK.		
REV.	DATE	DES.	REV.	DATE	DES.			

WIRING DIAGRAM
FVA-FOB/2-3
Steam generator circuit

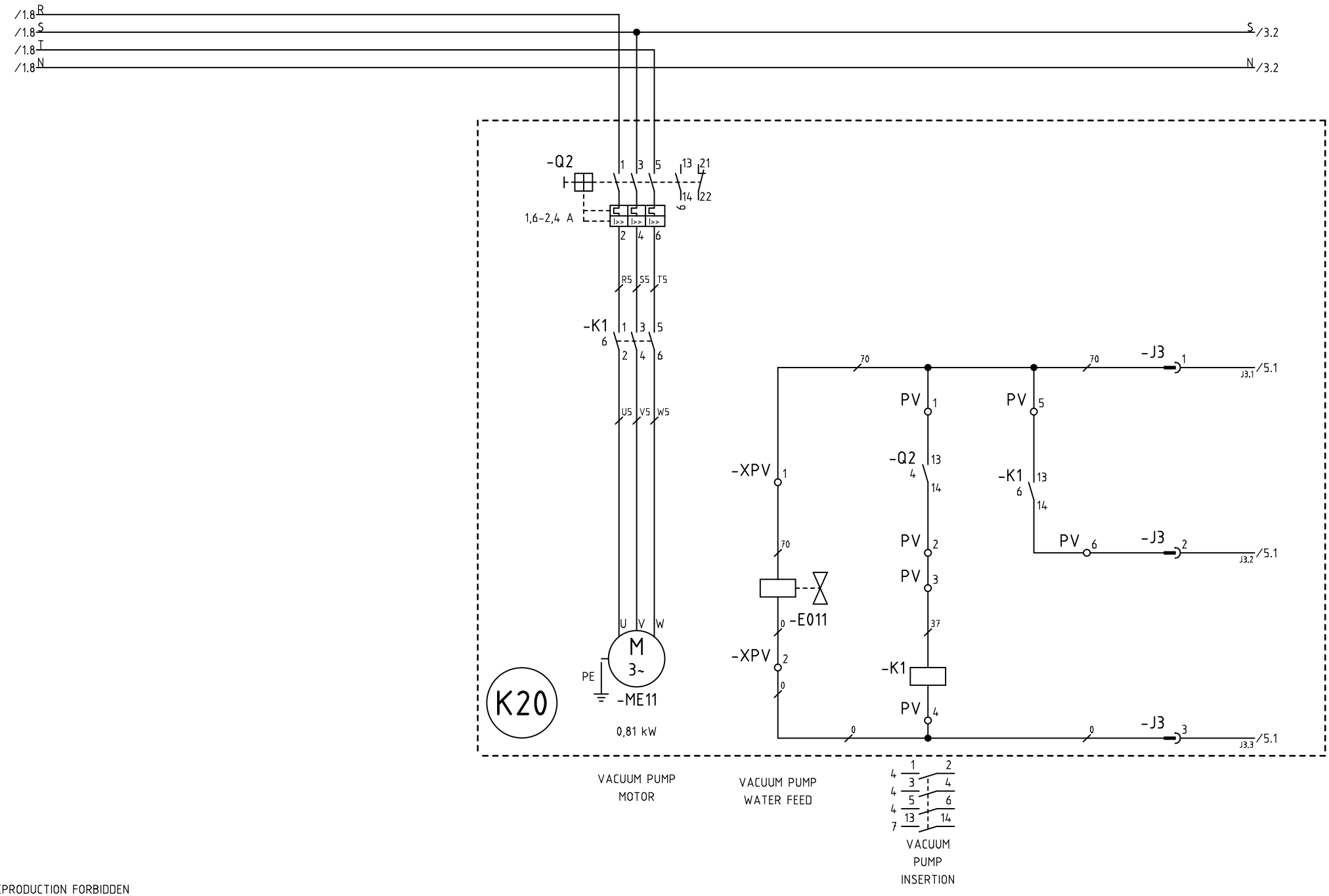
FEDEGARI AUTOCLAVI SPA

GN010835

I-G

Sheet 1

6 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.	REV.	DATE	DES.
3			6		
2			5		
1			4		

DATE	15.11.2000
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Vacuum pump circuit

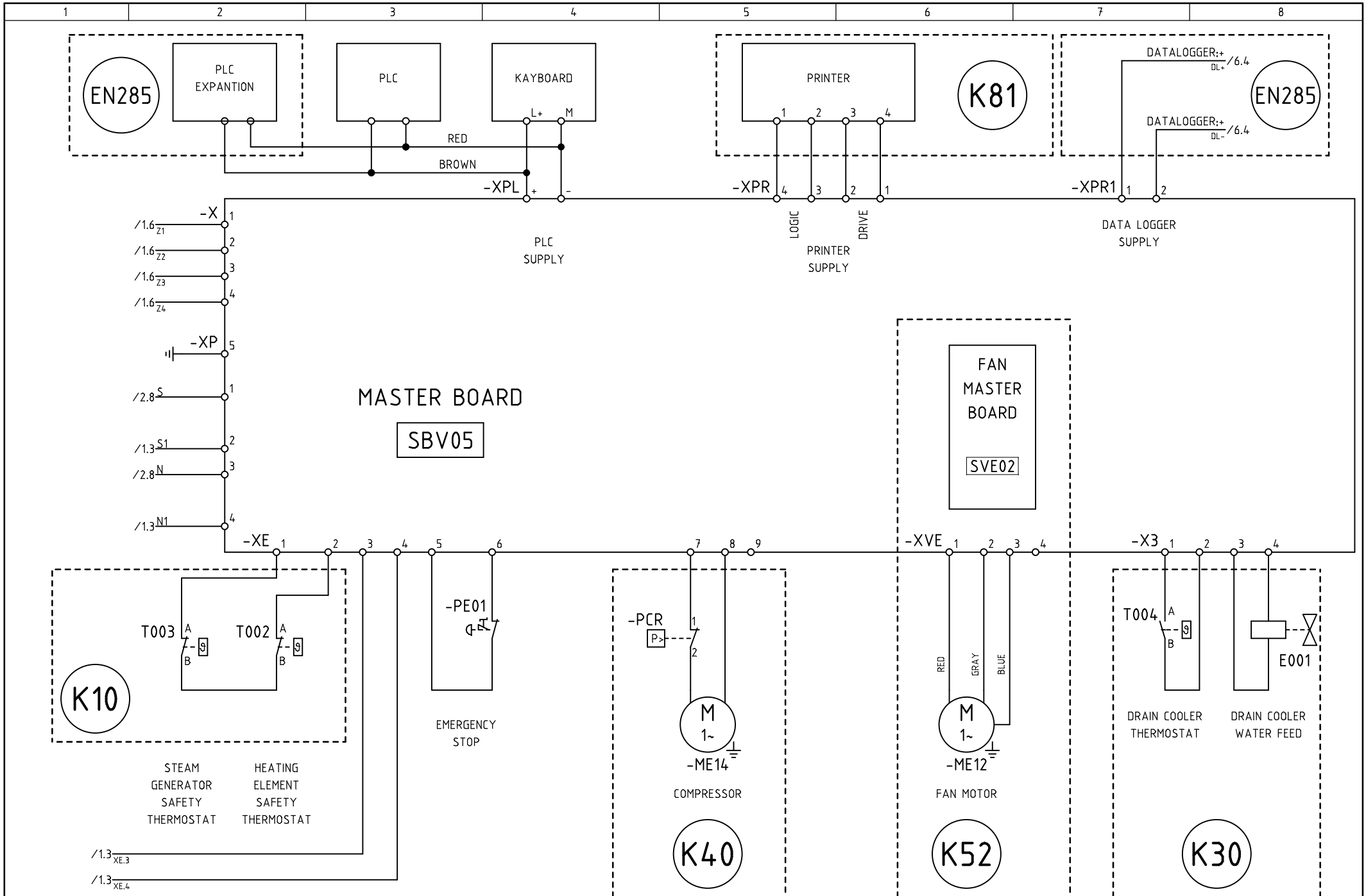
FEDEGARI AUTOCLAVI SPA

GN010835

I-G

Sheet 2

6 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.	REV.	DATE	DES.
3			6		
2			5		
1			4		

DATE	15.11.2000
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Auxiliary circuit/digital inputs

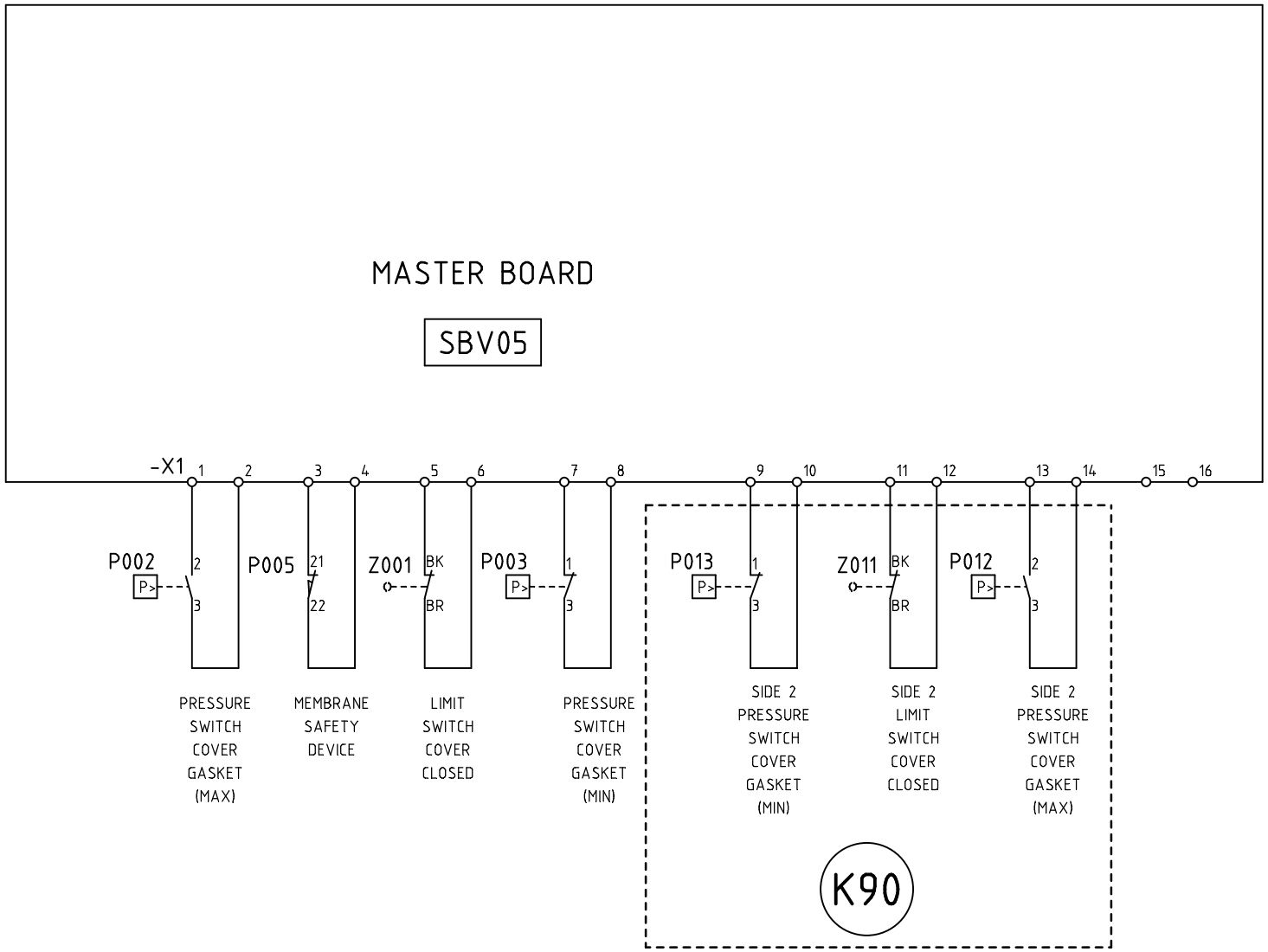
FEDEGARI AUTOCLAVI SPA

GN010835

I-G

Sheet 3

6 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.
3		
2		
1		

REV.	DATE	DES.
6		
5		
4		

DATE	15.11.2000
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Digital inputs

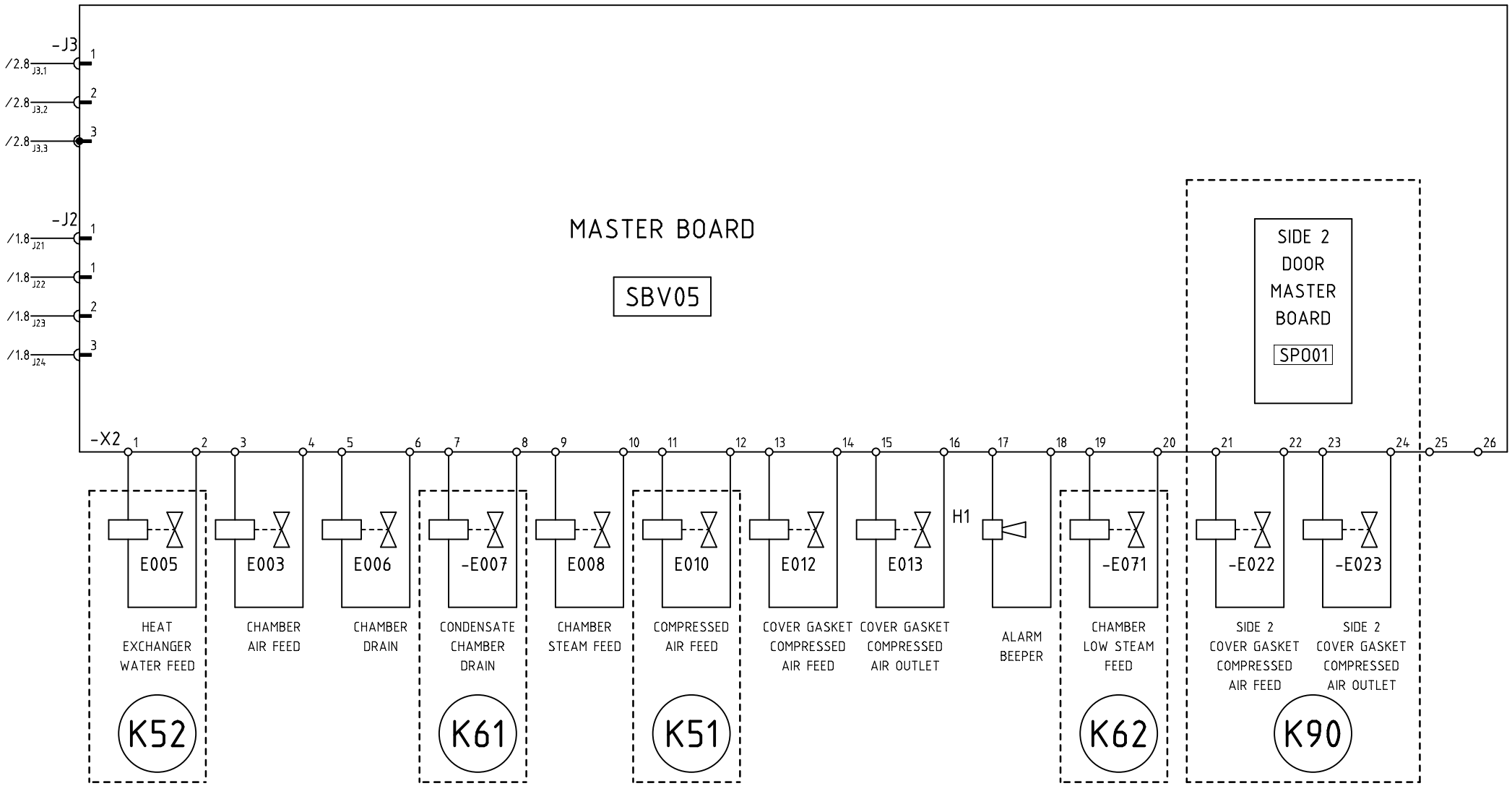
FEDEGARI AUTOCLAVI SPA

GN010835

I-G

Sheet 4

6 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.	REV.	DATE	DES.
3			6		
2			5		
1			4DOZ		

DATE	15.11.2000
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Digital outputs

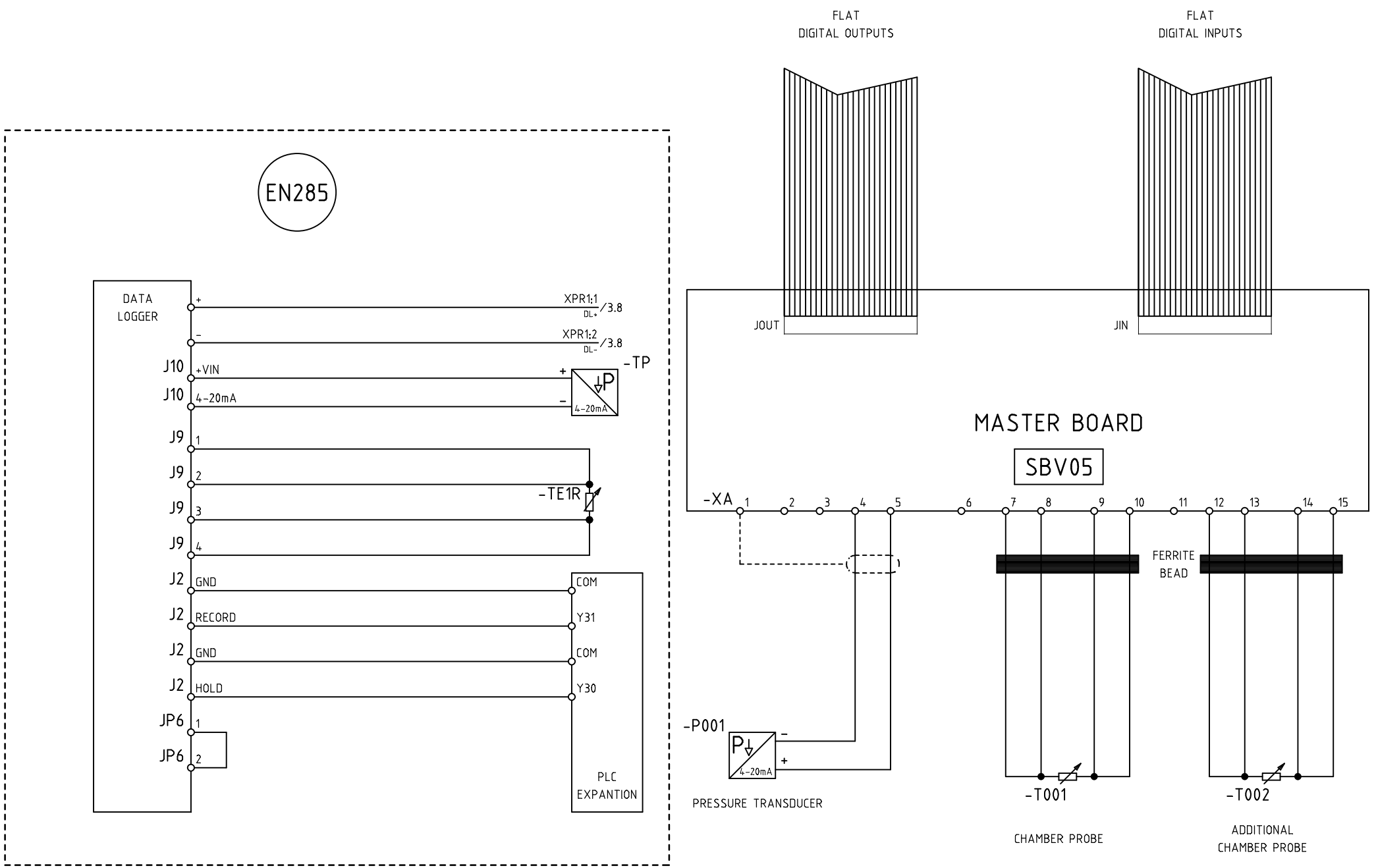
FEDEGARI AUTOCLAVI SPA

GN010835

I-G

Sheet 5

6 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.	REV.	DATE	DES.
3			6		
2			5		
1			4		

DATE	15.11.2000
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Analog inputs/PLC connection

FEDEGARI AUTOCLAVI SPA

GN010835

I-G

Sheet 6

6 Fg.

REPRODUCTION FORBIDDEN

REV.	DATE	DES.
1		
2		
3		
4		
5		
6		

	DES.	DATE
	CHK.	
	ROC	15.11.2000

WIRING DIAGRAM
FVA-FOB/2-3
Terminal block drawing

FEDEGARI AUTOCLAVI SPA

GN010835

M-G

Sheet 1
3 Fg.

Element description	Wire description	Start terminal: Element symbol	Start terminal: Contact	Wiring list: Terminal No.	Wiring list: Terminal connections	Wiring list: Terminal description	Wiring list: Wire connection	Wiring list: Wiring diagram reference	Stop terminal: Element symbol	Stop terminal: Contact	Wire description	Element description
Terminal board : -XGE												
Total 2 terminals												
	XGE1	-Q0	T	1				/1.7	SGV05	XGE	1	
	XGE2	-Q0	N	2				/1.7	SGV05	XGE	2	
Terminal board : -XG												
Total 15 terminals												
	XG1	ME13	3	1				/1.5	SGV05	XG	1	
	XG2	ME13	2	2				/1.5	SGV05	XG	2	
	XG3	ME13	1	3				/1.5	SGV05	XG	3	
	XG4	-E009		4				/1.5	SGV05	XG	4	
	XG5	-E009		5				/1.5	SGV05	XG	5	
				6				/1.6	SGV05	XG	6	
				7				/1.6	SGV05	XG	7	
	XG8	-P004	1	8				/1.7	SGV05	XG	8	
	XG9	-P004	3	9				/1.7	SGV05	XG	9	
	XG10	-L001		10				/1.7	SGV05	XG	10	
	XG11	-L001		11				/1.7	SGV05	XG	11	
	XG12	-L001		12				/1.7	SGV05	XG	12	
	XG13	-L002		13				/1.8	SGV05	XG	13	
	XG14	-L002		14				/1.8	SGV05	XG	14	
	XG15	-L002		15				/1.8	SGV05	XG	15	
Terminal board : -J2												
Total 4 terminals												
		SBV04 J2-1		1				/1.7	SGV05	J2-1		
		SBV04 J2-2		2				/1.7	SGV05	J2-2		
		SBV04 J2-3		3				/1.8	SGV05	J2-3		
		SBV04 J2-4		4				/1.8	SGV05	J2-4		
Terminal board : -PV												
Total 6 terminals												
	70	-Q2	13	1				/2.6	SPV01	PV-1	70	
	37	-Q2	14	2				/2.6	SPV01	PV-2	37	
	37	-K1	A1	3				/2.6	SPV01	PV-3	37	
	0	-K1	A2	4				/2.6	SPV01	PV-4	0	
	70	-K1	13	5				/2.7	SPV01	PV-5	70	
	070	-K1	14	6				/2.7	SPV01	PV-6	070	
Terminal board : -XPV												
Total 2 terminals												
	XPV1	-E011		1				/2.5	SPV01	XPV	1	
	XPV2	-E011		2				/2.5	SPV01	XPV	2	
Terminal board : -J3												
Total 3 terminals												
		SBV05 J3-1		1				/2.7	SPV01	J3-1		
		SBV05 J3-2		2				/2.7	SPV01	J3-2		
		SBV05 J3-3		3				/2.7	SPV01	J3-3		
Terminal board : -X												
Total 5 terminals												
	X1	-T1	18V	1				/3.2	SBV05	X	1	
	X2	-T1	0V	2				/3.2	SBV05	X	2	
	X3	-T1	18V	3				/3.2	SBV05	X	3	
	X4	-T1	0V	4				/3.2	SBV05	X	4	
Terminal board : -XP												
Total 5 terminals												
	XP1	-Q0	S	1				/3.2	SBV05	XP	1	
	XP2	-Q0	S	2				/3.2	SBV05	XP	2	
	XP3	-Q0	N	3				/3.2	SBV05	XP	3	
	XP4	-Q0	N	4				/3.2	SBV05	XP	4	
	XP5	PE		5				/3.2	SBV05	XP	5	

REPRODUCTION FORBIDDEN

REV.	1	2	3
DATE			
DES.			

REV.	4	5	6
DATE			
DES.			

	DATE	15.11.2000
	DES.	ROC
	CHK.	

WIRING DIAGRAM

FVA-FOB/2-3

Terminal block drawing

FEDEGARI AUTOCLAVI SPA

GN010835

M-G

Sheet 2

3 Fg.

Element description	Wire description	Start terminal: Element symbol	Start terminal: Contact	Wiring list: Terminal No.	Wiring list: Terminal connections	Wiring list: Terminal description	Wiring list: Wire connection	Wiring list: Wiring diagram reference	Stop terminal: Element symbol	Stop terminal: Contact	Wire description	Element description
Terminal board : -XPL												
Total 2 terminals												
	XPL+	-PLC	L+	1				/3.3	SBV05	XPL	1	
	XPL-	-PLC	M	2				/3.3	SBV05	XPL	2	
Terminal board : -XPR												
Total 4 terminals												
	XG1	PRT	4	1				/3.4	SBV05	XPR	1	
	XG2	PRT	3	2				/3.5	SBV05	XPR	2	
	XG3	PRT	2	3				/3.5	SBV05	XPR	3	
	XG4	PRT	1	4				/3.5	SBV05	XPR	4	
Terminal board : -XPR1												
Total 2 terminals												
	XG1	PRT	1	1				/3.4	SBV05	XPR1	1	
	XG2	PRT	2	2				/3.5	SBV05	XPR1	2	
Terminal board : -XE												
Total 9 terminals												
	XE1	-T003	A	1				/3.2	SBV05	XE	1	
	XE2	-T002	B	2				/3.3	SBV05	XE	2	
	XE3	-Q0	A1	3				/3.3	SBV05	XE	3	
	XE4	-Q0	A2	4				/3.3	SBV05	XE	4	
	XE5	-PEM		5				/3.3	SBV05	XE	5	
	XE6	-PEM		6				/3.4	SBV05	XE	6	
	XE7	-ME14		7				/3.4	SBV05	XE	7	
	XE8	-ME14		8				/3.4	SBV05	XE	8	
				9				/3.4	SBV05	XE	9	
Terminal board : -XVE												
Total 4 terminals												
	XVE1	-ME12	RD	1				/3.5	SBV05	XVE	1	
	XVE2	-ME12	GR	2				/3.6	SBV05	XVE	2	
	XVE3	-ME12	BK	3				/3.6	SBV05	XVE	3	
				4				/3.6	SBV05	XVE	4	
Terminal board : -X3												
Total 4 terminals												
	X3-1	-T004	A	1				/3.7	SBV05	X3	1	
	X3-2	-T004	B	2				/3.7	SBV05	X3	2	
	X3-3	-E001		3				/3.7	SBV05	X3	3	
	X3-4	-E001		4				/3.7	SBV05	X3	4	
Terminal board : -X1												
Total 16 terminals												
	X1-1	-P002	2	1				/4.3	SBV05	X1	1	
	X1-2	-P002	3	2				/4.3	SBV05	X1	2	
	X1-3	-P005	21	3				/4.3	SBV05	X1	3	
	X1-4	-P005	22	4				/4.3	SBV05	X1	4	
	X1-5	-Z001	BK	5				/4.4	SBV05	X1	5	
	X1-6	-Z001	BR	6				/4.4	SBV05	X1	6	
	X1-7	-P003	1	7				/4.5	SBV05	X1	7	
	X1-8	-P003	3	8				/4.5	SBV05	X1	8	
	X1-9	-P013	1	9				/4.5	SBV05	X1	9	
	X1-10	-P013	3	10				/4.5	SBV05	X1	10	
	X1-11	-Z011	BK	11				/4.6	SBV05	X1	11	
	X1-12	-Z011	BR	12				/4.6	SBV05	X1	12	
	X1-13	-P012	2	13				/4.6	SBV05	X1	13	
	X1-14	-P012	3	14				/4.6	SBV05	X1	14	
				15				/4.7	SBV05	X1	15	
				16				/4.7	SBV05	X1	16	

REPRODUCTION FORBIDDEN

REV.	DATE	DES.
1		
2		
3		
4		
5		
6		

	DATE	15.11.2000
	DES.	ROC
	CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Terminal block drawing

FEDEGARI AUTOCLAVI SPA

GN010835

M-G

Sheet 3
3 Fg.

Element description	Wire description	Start terminal: Element symbol	Start terminal: Contact	Wiring list: Terminal No.	Wiring list: Terminal connections	Wiring list: Terminal description	Wiring list: Wire connection	Wiring list: Wiring diagram reference	Stop terminal: Element symbol	Stop terminal: Contact	Wire description	Element description
Terminal board : -XA												
Total 15 terminals												
		XA1	P001 SCH	1				/6.5	SBV05	XA	1	
				2				/6.5	SBV05	XA	2	
				3				/6.5	SBV05	XA	3	
		XA4	-P001 -	4				/6.6	SBV05	XA	4	
		XA5	-P001 +	5				/6.6	SBV05	XA	5	
				6				/6.6	SBV05	XA	6	
			-T001	7				/6.7	SBV05	XA	7	
			-T001	8				/6.7	SBV05	XA	8	
		XA9	-T001	9				/6.7	SBV05	XA	9	
		XA10	-T001	10				/6.7	SBV05	XA	10	
				11				/6.7	SBV05	XA	11	
		XA12	-T002	12				/6.8	SBV05	XA	12	
		XA13	-T002	13				/6.8	SBV05	XA	13	
		XA14	-T002	14				/6.8	SBV05	XA	14	
		XA15	-T002	15				/6.8	SBV05	XA	15	
Terminal board : -X2												
Total 26 terminals												
		X2-1	-E005	1				/5.2	SBV05	X1	1	
		X2-2	-E005	2				/5.2	SBV05	X2	2	
		X2-3	-E003	3				/5.2	SBV05	X2	3	
		X2-4	-E003 -	4				/5.2	SBV05	X2	4	
		X2-5	-E006	5				/5.3	SBV05	X2	5	
		X2-6	-E006	6				/5.3	SBV05	X2	6	
		X2-7	-E007	7				/5.3	SBV05	X2	7	
		X2-8	-E004	8				/5.4	SBV05	X2	8	
		X2-9	-E008	9				/5.4	SBV05	X2	9	
		X2-10	-E008	10				/5.4	SBV05	X2	10	
		X2-11	-E010	11				/5.4	SBV05	X2	11	
		X2-12	-E010	12				/5.5	SBV05	X2	12	
		X2-13	-E012	13				/5.5	SBV05	X2	13	
		X2-14	-E012	14				/5.5	SBV05	X2	14	
		X2-15	-E013	15				/5.5	SBV05	X2	15	
		X2-16	-E013	16				/5.6	SBV05	X2	16	
		X2-17	-H1	17				/5.6	SBV05	X2	17	
		X2-18	-H1	18				/5.6	SBV05	X2	18	
		X2-19	-E071	19				/5.6	SBV05	X2	19	
		X2-20	-E071	20				/5.7	SBV05	X2	20	
		X2-21	-E022	21				/5.7	SBV05	X2	21	
		X2-22	-E022	22				/5.7	SBV05	X2	22	
		X2-23	-E023	23				/5.8	SBV05	X2	23	
		X2-24	-E023	24				/5.8	SBV05	X2	24	
				25				/5.8	SBV05	X2	25	
				26				/5.8	SBV05	X2	26	

Tag	Refer.	Type	Manufacturer	Comments			Description	Code
				V	W	A		
-Q0	/1.1	C60L25452	MERLIN-GERIN			25A	Main switch	CD340090
-U	/1.2	MN26960	MERLIN-GERIN	230V 50Hz			Shunt trip	CD340091
-Q1	/1.3	5403050FF16A	WIMEX	500Vca		16A	Fasten fuses	CD150048
-S1	/1.2	83523	CROUZET				Electrical control panel door limit switch	CD200042
-T1	/1.4	TK12000003S	ISE	230/18/18	100 VA		Transformer	CD170030
-SSR1	/1.3	D53TP25D	CRYDOM	480Vca		25A	Solid state relay	CD180022
FILTER	/1.3	3F20	CRYDOM				Solid state relay filter	CD100005
-SGV05	/1.4	SGV05	FEDEGARI				Steam generator master board	CE100078
-Q2	/2.4	3RV1011-1CA10	SIEMENS	600Vca		1,6-2,5A	Thermal-magnetic motor circuit breaker	CD160041
-K1	/2.4	3RT1015-1BB41	SIEMENS	24V cc		9A	Contactor	CD150046
//	//	3RV1901-1E	SIEMENS				Auxiliary contact for contactor	
-SPV02	/2.4	SPV02	FEDEGARI				Vacuum pump master board	CE100112
-SBV05	/3.1	SBV05	FEDEGARI				Master board	CE100229
-SPO01	/5.8	SPO01	FEDEGARI				Side 2 door control board	CE100131
-SVE02	/3.6	SVE02	FEDEGARI				Fan master board	CE100079
-PLC	/3.2	AFC22352C	MATSUSHITA	24V cc			PLC	CE100107
-KAIBORD	/3.3	TCP01R-04-0245	MATSUSHITA	24V cc			Kaibord	CD340061
-PRINTER	/3.4	FT190-S3	CUSTOM ENGINEERING	5V cc			Printer	CE020017
DATA LOG	/3.4	FT190TL	CUSTOM ENGINEERING	24V cc			Printer for EN285 rules	CE020020
-AD1		ADPLC/F32-1	TECNA				Analogicals/digitals converter	CE100113

REPRODUCTION FORBIDDEN

REV.	DATE	DES.	REV.	DATE	DES.
3			6		
2			5		
1			4		

DATE 15.11.2000
DES. ROC
CHK.

WIRING DIAGRAM
FVA-FOB/2-3
Components list

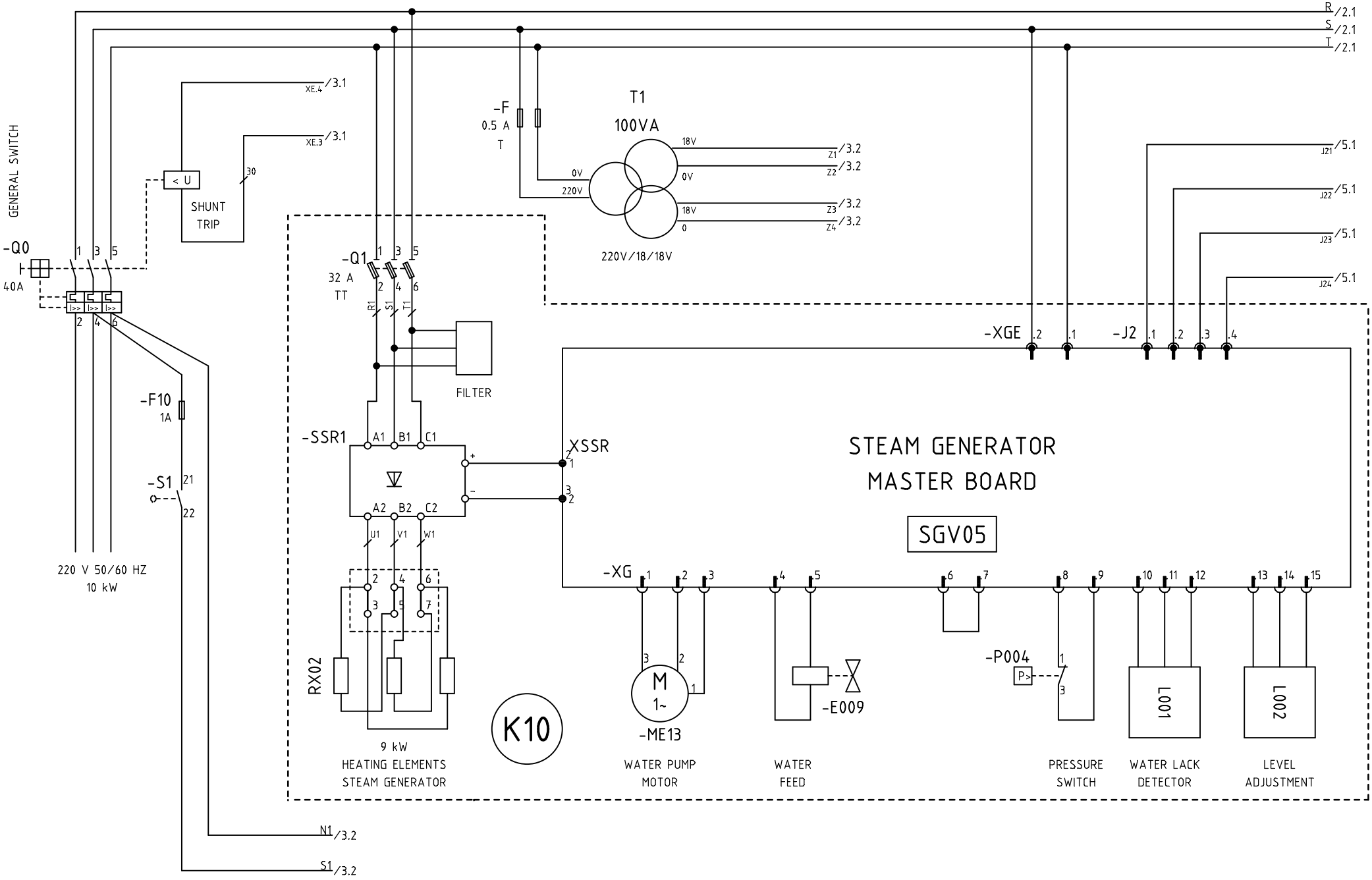
FEDEGARI AUTOCLAVI SPA

GN010568

D-C

Sheet 1

1 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.	REV.	DATE	DES.
3			6		
2			5		
1			4		

DATE	17.01.2001
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Steam generator circuit

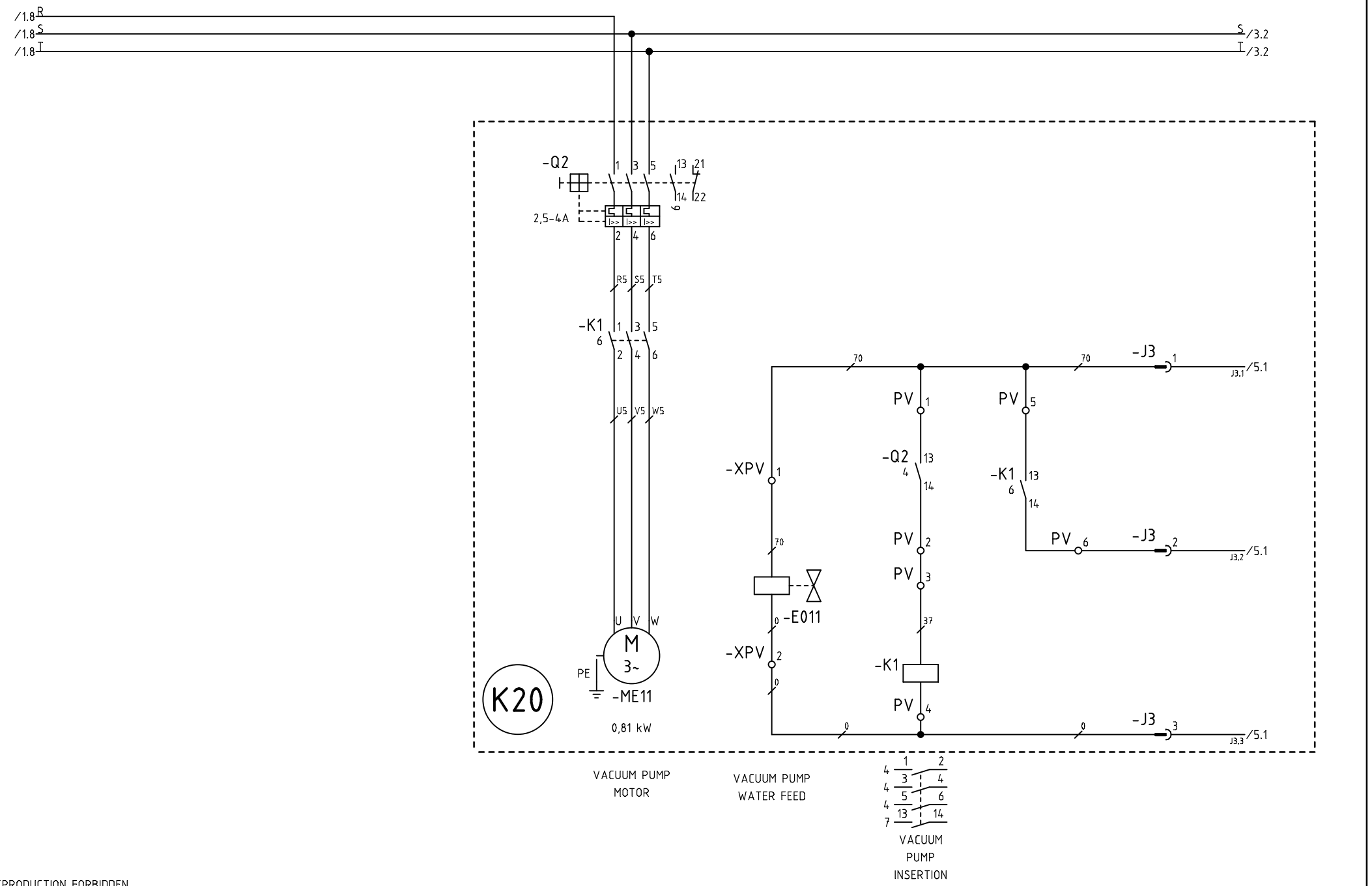
FEDEGARI AUTOCLAVI SPA

GN010856

I-G

Sheet 1

6 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.	REV.	DATE	DES.
3			6		
2			5		
1			4		

DATE	17.01.2001
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Vacuum pump circuit

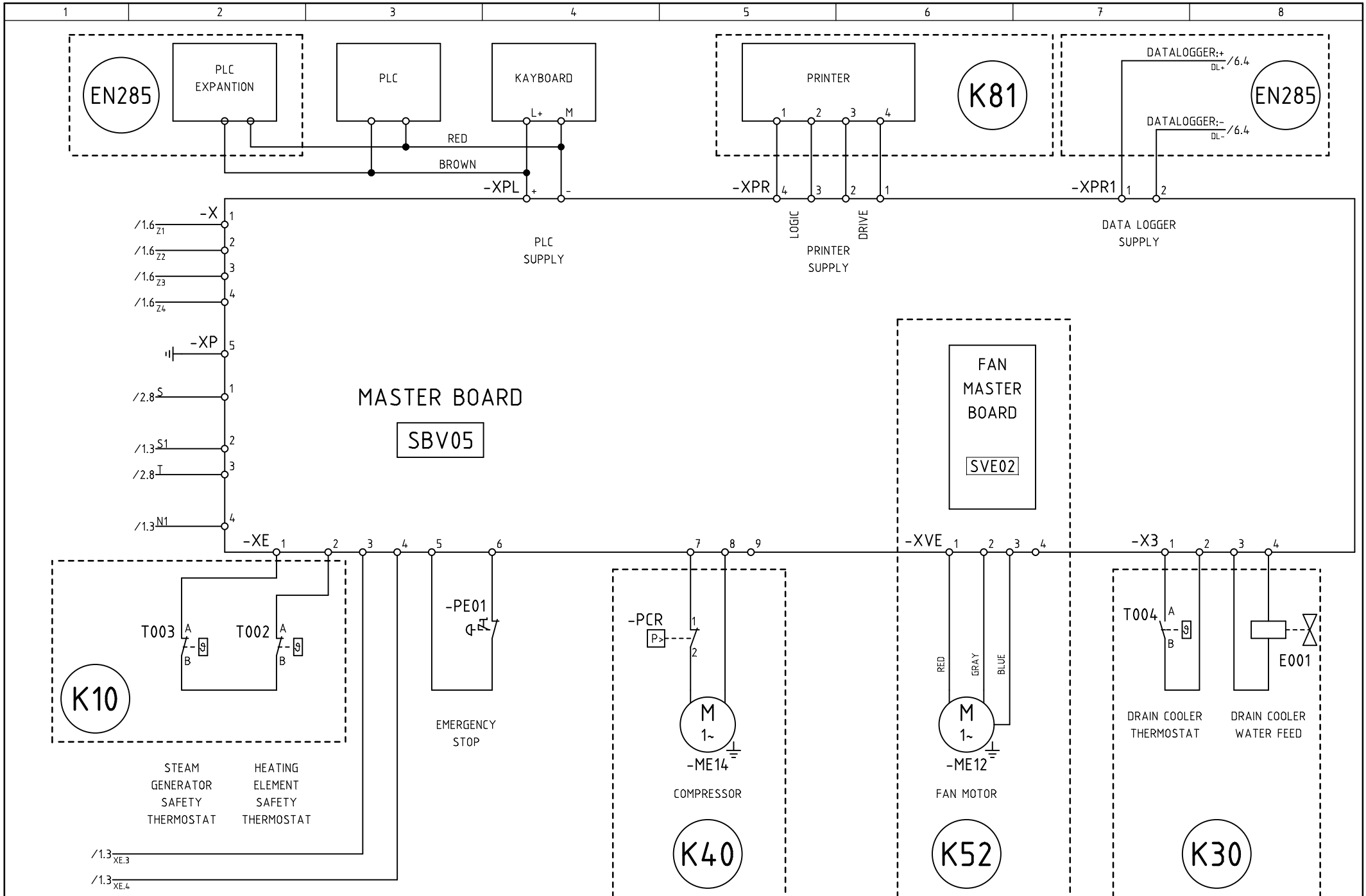
FEDEGARI AUTOCLAVI SPA

GN010856

I-G

Sheet 2

6 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.	REV.	DATE	DES.
3			6		
2			5		
1			4		

DATE	17.01.2001
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Auxiliary circuit/digital inputs

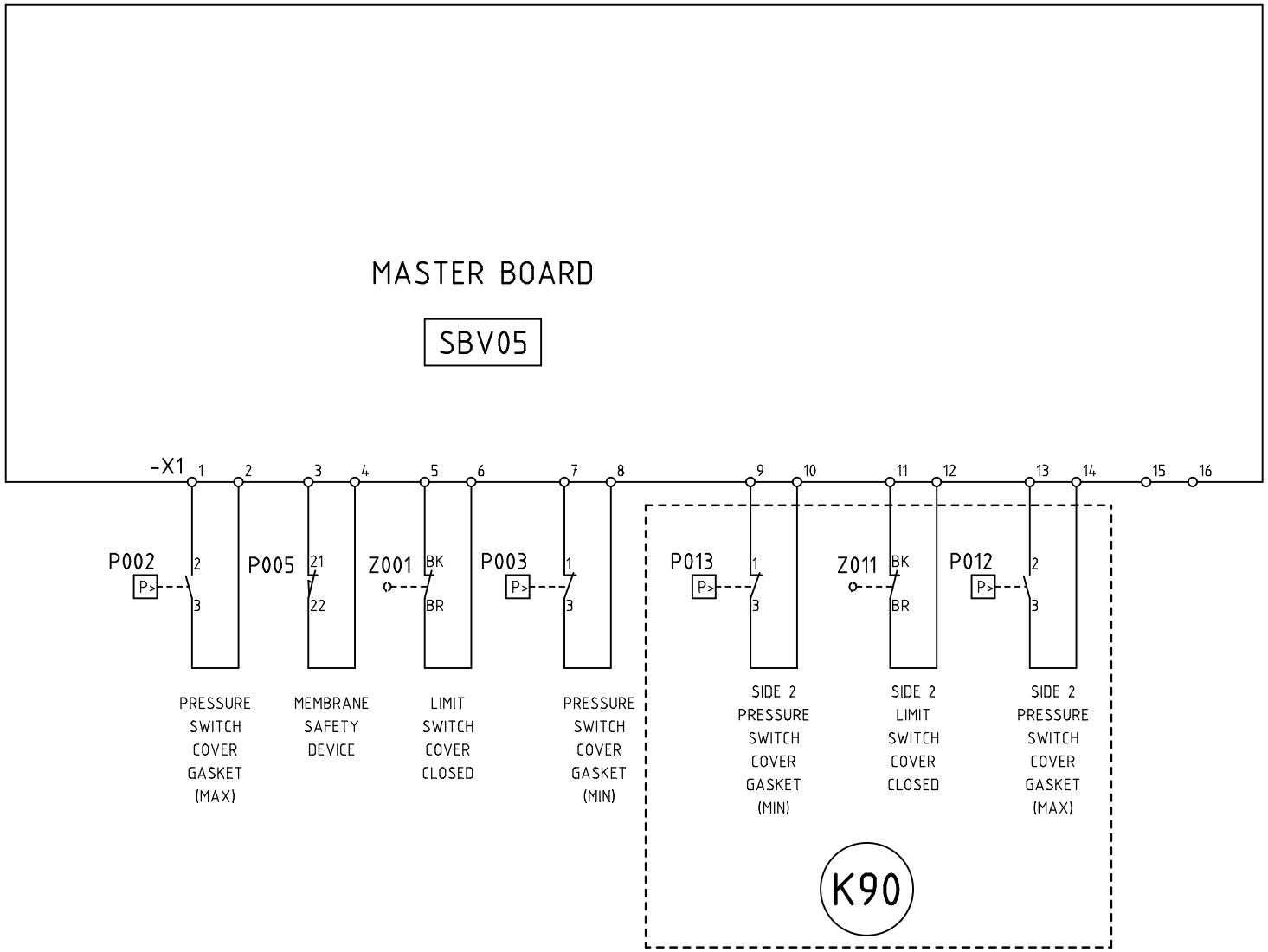
FEDEGARI AUTOCLAVI SPA

GN010856

I-G

Sheet 3

6 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.
3		
2		
1		

REV.	DATE	DES.
6		
5		
4		

DATE	17.01.2001
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Digital inputs

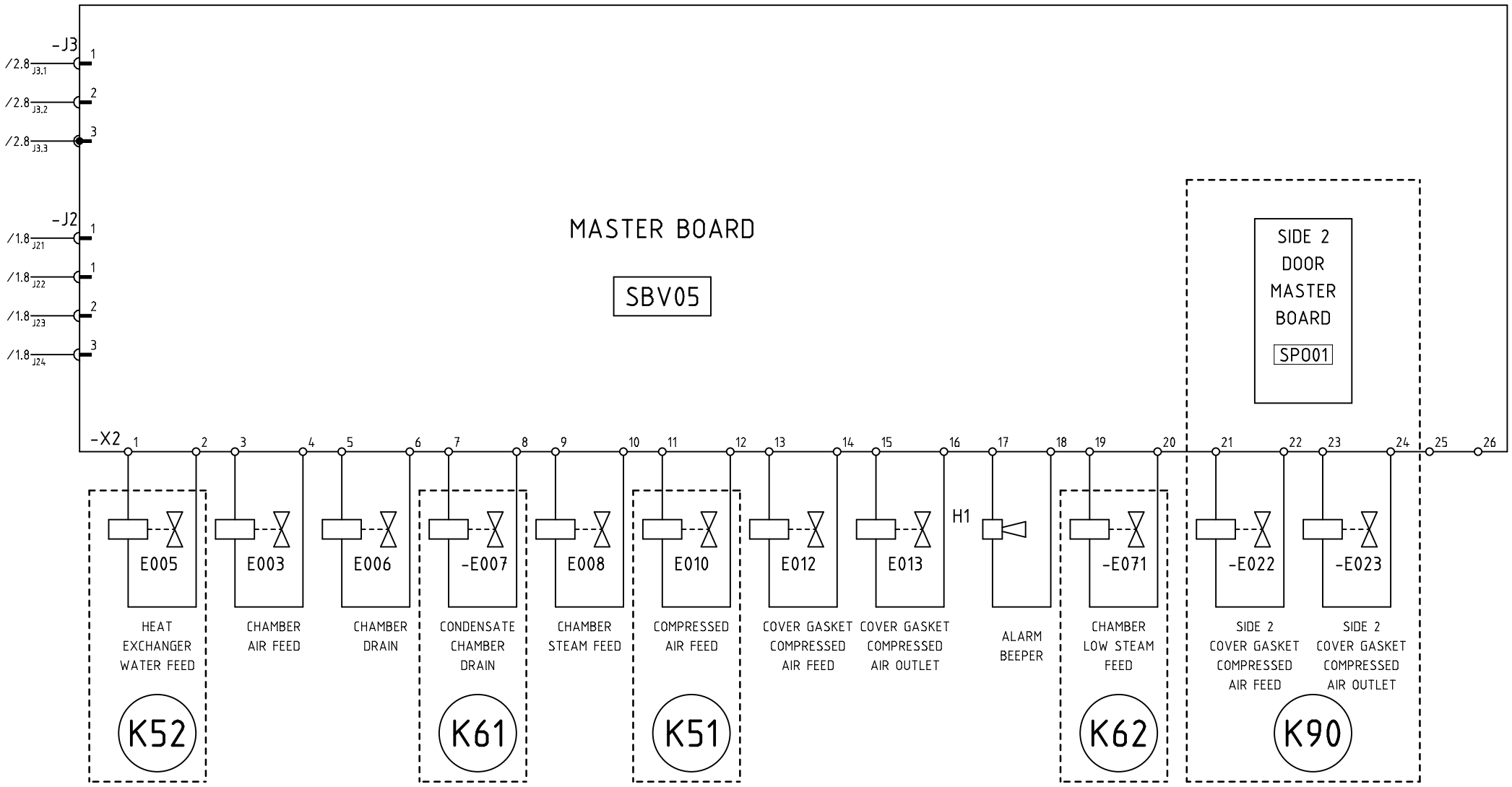
FEDEGARI AUTOCLAVI SPA

GN010856

I-G

Sheet 4

6 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.	REV.	DATE	DES.
3			6		
2			5		
1			4DOZ		

DATE	17.01.2001
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Digital outputs

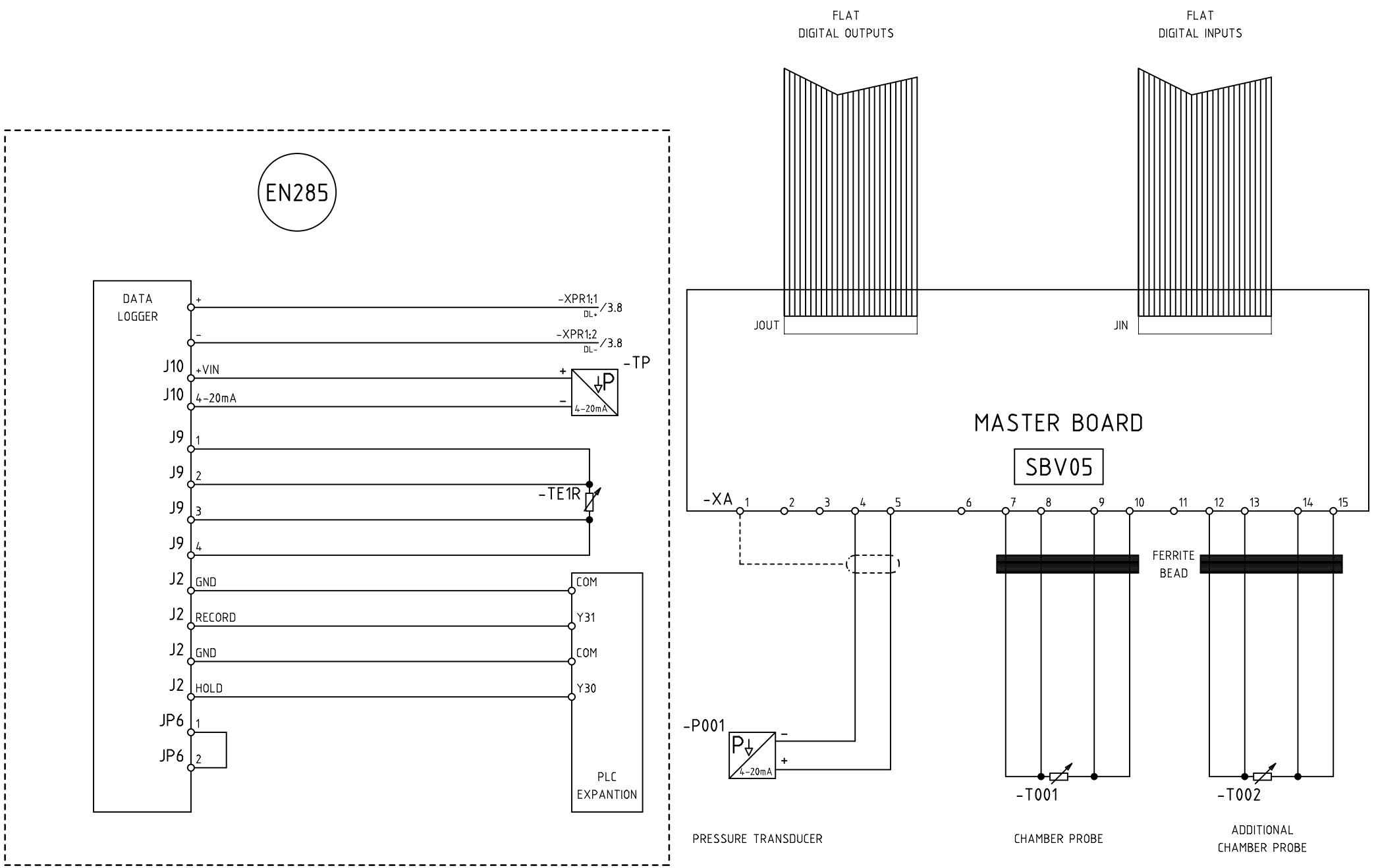
FEDEGARI AUTOCLAVI SPA

GN010856

I-G

Sheet 5

6 Fg.



REPRODUCTION FORBIDDEN

REV.	DATE	DES.
3		
2		
1		

REV.	DATE	DES.
6		
5		
4		

DATE	17.01.2001
DES.	ROC
CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Analog inputs/PLC connection

FEDEGARI AUTOCLAVI SPA

GN010856

I-G

Sheet 6

6 Fg.

REPRODUCTION FORBIDDEN

REV.	1	2	3	4	5	6
DATE						
DES.						

	DATE	DES.	CHK.
	17.01.2001	ROC	

Element description	Wire description	Start terminal: Element symbol	Start terminal: Contact	Wiring list: Terminal No.	Wiring list: Terminal connections	Wiring list: Terminal description	Wiring list: Wire connection	Wiring list: Wiring diagram reference	Stop terminal: Element symbol	Stop terminal: Contact	Wire description	Element description
Terminal board : -XGE												
Total 2 terminals												
	XGE1	-Q0	T	1				/1.7	SGV05	XGE	1	
	XGE2	-Q0	N	2				/1.7	SGV05	XGE	2	
Terminal board : -XG												
Total 15 terminals												
	XG1	ME13	3	1				/1.5	SGV05	XG	1	
	XG2	ME13	2	2				/1.5	SGV05	XG	2	
	XG3	ME13	1	3				/1.5	SGV05	XG	3	
	XG4	-E009		4				/1.5	SGV05	XG	4	
	XG5	-E009		5				/1.5	SGV05	XG	5	
				6				/1.6	SGV05	XG	6	
				7				/1.6	SGV05	XG	7	
	XG8	-P004	1	8				/1.7	SGV05	XG	8	
	XG9	-P004	3	9				/1.7	SGV05	XG	9	
	XG10	-L001		10				/1.7	SGV05	XG	10	
	XG11	-L001		11				/1.7	SGV05	XG	11	
	XG12	-L001		12				/1.7	SGV05	XG	12	
	XG13	-L002		13				/1.8	SGV05	XG	13	
	XG14	-L002		14				/1.8	SGV05	XG	14	
	XG15	-L002		15				/1.8	SGV05	XG	15	
Terminal board : -J2												
Total 4 terminals												
		SBV04 J2-1		1				/1.7	SGV05	J2-1		
		SBV04 J2-2		2				/1.7	SGV05	J2-2		
		SBV04 J2-3		3				/1.8	SGV05	J2-3		
		SBV04 J2-4		4				/1.8	SGV05	J2-4		
Terminal board : -PV												
Total 6 terminals												
	70	-Q2	13	1				/2.6	SPV01	PV-1	70	
	37	-Q2	14	2				/2.6	SPV01	PV-2	37	
	37	-K1	A1	3				/2.6	SPV01	PV-3	37	
	0	-K1	A2	4				/2.6	SPV01	PV-4	0	
	70	-K1	13	5				/2.7	SPV01	PV-5	70	
	070	-K1	14	6				/2.7	SPV01	PV-6	070	
Terminal board : -XPV												
Total 2 terminals												
	XPV1	-E011		1				/2.5	SPV01	XPV	1	
	XPV2	-E011		2				/2.5	SPV01	XPV	2	
Terminal board : -J3												
Total 3 terminals												
		SBV05 J3-1		1				/2.7	SPV01	J3-1		
		SBV05 J3-2		2				/2.7	SPV01	J3-2		
		SBV05 J3-3		3				/2.7	SPV01	J3-3		
Terminal board : -X												
Total 5 terminals												
	X1	-T1	18V	1				/3.2	SBV05	X	1	
	X2	-T1	0V	2				/3.2	SBV05	X	2	
	X3	-T1	18V	3				/3.2	SBV05	X	3	
	X4	-T1	0V	4				/3.2	SBV05	X	4	
Terminal board : -XP												
Total 5 terminals												
	XP1	-Q0	S	1				/3.2	SBV05	XP	1	
	XP2	-Q0	S	2				/3.2	SBV05	XP	2	
	XP3	-Q0	N	3				/3.2	SBV05	XP	3	
	XP4	-Q0	N	4				/3.2	SBV05	XP	4	
	XP5	PE		5				/3.2	SBV05	XP	5	

WIRING DIAGRAM
FVA-FOB/2-3
Terminal block drawing

FEDEGARI AUTOCLAVI SPA

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REPRODUCTION FORBIDDEN

REV.	1	2	3
DATE			
DES.			

REV.	4	5	6
DATE			
DES.			

	DATE	17.01.2001
	DES.	ROC
	CHK.	

WIRING DIAGRAM

FVA-FOB/2-3

Terminal block drawing

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Sheet 2

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Element description	Wire description	Start terminal: Element symbol	Start terminal: Contact	Wiring list: Terminal No.	Wiring list: Terminal connections	Wiring list: Terminal description	Wiring list: Wire connection	Wiring list: Wiring diagram reference	Stop terminal: Element symbol	Stop terminal: Contact	Wire description	Element description
Terminal board : -XPL												
Total 2 terminals												
	XPL+	-PLC	L+	1				/3.3	SBV05	XPL	1	
	XPL-	-PLC	M	2				/3.3	SBV05	XPL	2	
Terminal board : -XPR												
Total 4 terminals												
	XG1	PRT	4	1				/3.4	SBV05	XPR	1	
	XG2	PRT	3	2				/3.5	SBV05	XPR	2	
	XG3	PRT	2	3				/3.5	SBV05	XPR	3	
	XG4	PRT	1	4				/3.5	SBV05	XPR	4	
Terminal board : -XPR1												
Total 2 terminals												
	XG1	PRT	1	1				/3.4	SBV05	XPR1	1	
	XG2	PRT	2	2				/3.5	SBV05	XPR1	2	
Terminal board : -XE												
Total 9 terminals												
	XE1	-T003	A	1				/3.2	SBV05	XE	1	
	XE2	-T002	B	2				/3.3	SBV05	XE	2	
	XE3	-Q0	A1	3				/3.3	SBV05	XE	3	
	XE4	-Q0	A2	4				/3.3	SBV05	XE	4	
	XE5	-PEM		5				/3.3	SBV05	XE	5	
	XE6	-PEM		6				/3.4	SBV05	XE	6	
	XE7	-ME14		7				/3.4	SBV05	XE	7	
	XE8	-ME14		8				/3.4	SBV05	XE	8	
				9				/3.4	SBV05	XE	9	
Terminal board : -XVE												
Total 4 terminals												
	XVE1	-ME12	RD	1				/3.5	SBV05	XVE	1	
	XVE2	-ME12	GR	2				/3.6	SBV05	XVE	2	
	XVE3	-ME12	BK	3				/3.6	SBV05	XVE	3	
				4				/3.6	SBV05	XVE	4	
Terminal board : -X3												
Total 4 terminals												
	X3-1	-T004	A	1				/3.7	SBV05	X3	1	
	X3-2	-T004	B	2				/3.7	SBV05	X3	2	
	X3-3	-E001		3				/3.7	SBV05	X3	3	
	X3-4	-E001		4				/3.7	SBV05	X3	4	
Terminal board : -X1												
Total 16 terminals												
	X1-1	-P002	2	1				/4.3	SBV05	X1	1	
	X1-2	-P002	3	2				/4.3	SBV05	X1	2	
	X1-3	-P005	21	3				/4.3	SBV05	X1	3	
	X1-4	-P005	22	4				/4.3	SBV05	X1	4	
	X1-5	-Z001	BK	5				/4.4	SBV05	X1	5	
	X1-6	-Z001	BR	6				/4.4	SBV05	X1	6	
	X1-7	-P003	1	7				/4.5	SBV05	X1	7	
	X1-8	-P003	3	8				/4.5	SBV05	X1	8	
	X1-9	-P013	1	9				/4.5	SBV05	X1	9	
	X1-10	-P013	3	10				/4.5	SBV05	X1	10	
	X1-11	-Z011	BK	11				/4.6	SBV05	X1	11	
	X1-12	-Z011	BR	12				/4.6	SBV05	X1	12	
	X1-13	-P012	2	13				/4.6	SBV05	X1	13	
	X1-14	-P012	3	14				/4.6	SBV05	X1	14	
				15				/4.7	SBV05	X1	15	
				16				/4.7	SBV05	X1	16	

REPRODUCTION FORBIDDEN

REV.	DATE	DES.
1		
2		
3		
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	DATE	17.01.2001
	DES.	ROC
	CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Terminal block drawing

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Sheet 3
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Element description	Wire description	Start terminal: Element symbol	Start terminal: Contact	Wiring list: Terminal No.	Wiring list: Terminal connections	Wiring list: Terminal description	Wiring list: Wire connection	Wiring list: Wiring diagram reference	Stop terminal: Element symbol	Stop terminal: Contact	Wire description	Element description
		Terminal board : -XA										
		Total 15 terminals										
		XA1	P001 SCH	1				/6.5	SBV05	XA	1	
				2				/6.5	SBV05	XA	2	
				3				/6.5	SBV05	XA	3	
		XA4	-P001 -	4				/6.6	SBV05	XA	4	
		XA5	-P001 +	5				/6.6	SBV05	XA	5	
				6				/6.6	SBV05	XA	6	
			-T001	7				/6.7	SBV05	XA	7	
			-T001	8				/6.7	SBV05	XA	8	
		XA9	-T001	9				/6.7	SBV05	XA	9	
		XA10	-T001	10				/6.7	SBV05	XA	10	
				11				/6.7	SBV05	XA	11	
		XA12	-T002	12				/6.8	SBV05	XA	12	
		XA13	-T002	13				/6.8	SBV05	XA	13	
		XA14	-T002	14				/6.8	SBV05	XA	14	
		XA15	-T002	15				/6.8	SBV05	XA	15	
		Terminal board : -X2										
		Total 26 terminals										
		X2-1	-E005	1				/5.2	SBV05	X1	1	
		X2-2	-E005	2				/5.2	SBV05	X2	2	
		X2-3	-E003	3				/5.2	SBV05	X2	3	
		X2-4	-E003 -	4				/5.2	SBV05	X2	4	
		X2-5	-E006	5				/5.3	SBV05	X2	5	
		X2-6	-E006	6				/5.3	SBV05	X2	6	
		X2-7	-E007	7				/5.3	SBV05	X2	7	
		X2-8	-E004	8				/5.4	SBV05	X2	8	
		X2-9	-E008	9				/5.4	SBV05	X2	9	
		X2-10	-E008	10				/5.4	SBV05	X2	10	
		X2-11	-E010	11				/5.4	SBV05	X2	11	
		X2-12	-E010	12				/5.5	SBV05	X2	12	
		X2-13	-E012	13				/5.5	SBV05	X2	13	
		X2-14	-E012	14				/5.5	SBV05	X2	14	
		X2-15	-E013	15				/5.5	SBV05	X2	15	
		X2-16	-E013	16				/5.6	SBV05	X2	16	
		X2-17	-H1	17				/5.6	SBV05	X2	17	
		X2-18	-H1	18				/5.6	SBV05	X2	18	
		X2-19	-E071	19				/5.6	SBV05	X2	19	
		X2-20	-E071	20				/5.7	SBV05	X2	20	
		X2-21	-E022	21				/5.7	SBV05	X2	21	
		X2-22	-E022	22				/5.7	SBV05	X2	22	
		X2-23	-E023	23				/5.8	SBV05	X2	23	
		X2-24	-E023	24				/5.8	SBV05	X2	24	
				25				/5.8	SBV05	X2	25	
				26				/5.8	SBV05	X2	26	

Tag	Refer.	Type	Manufacturer	Comments			Description	Code
				V	W	A		
-Q0	/1.1	C60L25441	MERLIN-GERIN			40A	Main switch	CD340095
-U	/1.2	MN26960	MERLIN-GERIN	230V 50Hz			Shunt trip	CD340091
-Q1	/1.3	5403065 32A	WIMEX	500Vca		32A	Fasten fuses	CD150048
-S1	/1.2	83523	CROUZET				Electrical control panel door limit switch	CD200042
-T1	/1.4	TK12000003S	ISE	230/18/18	100 VA		Transformer	CD170030
-SSR1	/1.3	D53TP50D	CRYDOM	480Vca		50A	Solid state relay	CD180055
FILTER	/1.3	3F20	CRYDOM				Solid state relay filter	CD100005
-SGV05	/1.4	SGV05	FEDEGARI				Steam generator master board	CE100078
-Q2	/2.4	3RV1011-1EA10	SIEMENS	600Vca		2,5-4A	Thermal-magnetic motor circuit breaker	CD160042
-K1	/2.4	3RT1015-1BB41	SIEMENS	24V cc		9A	Contactor	CD150046
//	//	3RV1901-1E	SIEMENS				Auxiliary contact for contactor	
-SPV02	/2.4	SPV02	FEDEGARI				Vacuum pump master board	CE100112
-SBV05	/3.1	SBV05	FEDEGARI				Master board	CE100229
-SPO01	/5.8	SPO01	FEDEGARI				Side 2 door control board	CE100131
-SVE02	/3.6	SVE02	FEDEGARI				Fan master board	CE100079
-PLC	/3.2	AFC22352C	MATSUSHITA	24V cc			PLC	CE100107
-KAIBORD	/3.3	TCP01R-04-0245	MATSUSHITA	24V cc			Kaibord	CD340061
-PRINTER	/3.4	FT190-S3	CUSTOM ENGINEERING	5V cc			Printer	CE020017
DATA LOG	/3.4	FT190TL	CUSTOM ENGINEERING	24V cc			Printer for EN285 rules	CE020020
-AD1		ADPLC/F32-1	TECNA				Analogicals/digitals converter	CE100113

REPRODUCTION FORBIDDEN

REV.	DATE	DES.	REV.	DATE	DES.		
3			6			DATE	17.01.2001
2			5			DES.	ROC
1			4			CHK.	

WIRING DIAGRAM
FVA-FOB/2-3
Components list

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